MANAGING SUPPLY CHAIN DISRUPTIONS

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MANAGING SUPPLY CHAIN DISRUPTIONS

Joseph B. Skipper

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MANAGING SUPPLY CHAIN DISRUPTIONS

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Joseph Benjamin Skipper graduated from Apalachicola High School in 1988. He then attended Andrew College in Cuthbert, GA where he received his A.S. in Business Administration. In 1992, he completed his studies at Troy State University with a B.S. in Marketing. After two years in private industry, Ben joined the United States Air Force and was commissioned a Second Lieutenant in January 1995. Over the next six years he held several leadership positions in North Carolina and Louisiana. In 2000, he attended the Air Force Institute of Technology's Graduate School of Engineering and Management in Dayton, Ohio. Completing his studies in 2002, he was assigned to the Air Force Logistics Management Agency where he conducted research aimed at improving supply chain support and management techniques for military operations worldwide. In August 2005, he began pursuit of his Doctorate degree at Auburn University. Upon graduation, he will be assigned to the Air Force Institute of Technology. He has published in *International Journal of Physical Distribution and Logistics Management*, *Journal of Transportation Management,* and *Journal of the International Academy for Case Studies*.

DISSERTATION ABSTRACT

MANAGING SUPPLY CHAIN DISRUPTIONS

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Doctor of Philosophy, August 9, 2008
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Supply Chain Management has become an important part of the business environment and the U.S. economy. The move towards improved efficiency and effectiveness for businesses, organizations, and process owners has forced many managers to think beyond traditional management techniques utilized in typical functional paradigms. As these supply chain process have become more streamlined the issue of increased risk and uncertainty has become ever more important. Many methods of controlling risk have been introduced and utilized by the research and practitioner fields, however, few provide a holistic view of what causes uncertainty, methods of dealing with that uncertainty, and how these methods are adopted by an organization.

This dissertation research effort incorporates three distinct efforts combined under a single umbrella topic. The first paper focuses on the underlying cause of uncertainty by proposing multiple levels of interdependence experienced by organizations within a hypothetical supply chain. Coordination strategies are then identified as coping mechanisms for interdependence issues. The second paper in this series focuses on one specific method of coordination, the contingency planning process. Characteristics of a contingency planning process are identified and their relationship to organizational flexibility is measured utilizing a regression technique. The third portion of the umbrella research effort addresses contingency planning as an innovation. Based on the research in paper two, contingency planning is a useful coordination technique for dealing with supply chain disruptions. This paper explores the attributes of a planning process that will most likely lead to successful innovation adoption. Each model presents broad perspective based on current literature and, hopefully, provides the foundation for many future research efforts.

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Finally, I can only hope to describe my deepest love and sincere gratitude to my wife and our two children for their unending support, patience, and encouragement. You continue to amaze me, and I thank God for you everyday. This effort is dedicated in memory of Clayton Skipper, Jr., who lived the example of what a father should be.

The views expressed in this dissertation are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the United States Government.

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CHAPTER 1: INTRODUCTION

Recent world events and related research have highlighted the need for effective solutions to organizational activity disruptions. Soon after the September 11 attacks, the Toyota Sequoia plant in Indiana came within hours of halting production due to delays in the delivery of critical steering sensors (Sheffi, 2001). In a separate instance, fire at a supplier facility forced Toyota to shut down 18 plants for nearly 2 weeks in February 1997. The estimated costs of the disruption included $195 million in damage and inventory loss with an additional estimated opportunity cost of lost sales of $325 million on 70,000 cars (Converium, 2006). In another disruption-related business event during the second quarter of 2001, Cisco experienced rapidly weakening demand corresponding with long-term supply agreements that combined to result in a $2.5 billion inventory write-off (Spekman & Davis, 2004). In yet another example, a relatively small fire in an Ericsson mobile phone sub-supplier resulted in an estimated $400 million loss, primarily due to the loss of the supplier. Ericsson was not able to meet customer demand of its key consumer products during a critical time and lost months of production capability (Norrman & Jansson, 2004).

As illustrated above, an organization must continuously identify, measure, and evaluate its operating environment. Complex organizations are very interdependent, with a single disruption creating a ripple effect that can dramatically impact the entire operation (Peck, 2005). These complex organizations may be a single entity, such as a

large corporation, or may exist as a group of entities linked together in a common or shared effort. In the latter case, the group of organizations is often referred to as a supply chain. While there are many technical definitions of a supply chain (Mentzer et al., 2001) a simple definition will suffice for the purposes of this study. Christopher (1992) defined a supply chain as the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer. This research effort will investigate the relationships, coordination strategies, and methods used by organizations as members of a supply chain in dealing with disruptions.

The management of a highly interconnected organization is an ever-increasing challenge in today's competitive business environment. Higher levels of uncertainty in supply and demand, shorter technology and product life cycles, the globalization of the market, and the increased use of distribution, manufacturing, and logistics partners result in a complex international network. As the levels of complexity increase and interdependency becomes more prevalent, increased levels of risk occur (Christopher, 1992). Many studies have used a variety of approaches to attempt to investigate the techniques used to manage these complex issues. A wide range of topics, including risk management (Finch, 2004), operational strategies (Croxton et al., 2001), proactive management (Sinha, Whitman, & Malzahn, 2004), and supply chain design (Lowson, 2002) have all contributed to the level of understanding of how to manage today's complex and interdependent organizations.

Supply chain disruptions are unplanned events that might affect the normal, expected flow of materials, information, and components (Svensson, 2002), and are

recognized as an inevitability within a supply chain organization. Stated differently, a disruption event is the manifestation of risk within the supply chain process. It is not a matter of a supply chain system encountering a problem, but rather a matter of when a problematic event will occur and how severe it will be. Therefore, the study of risk, interdependence, and the associated impact of a disruption is a growing area of interest to many as they strive to reduce their organization's risk of disruption. An organization must continuously identify, measure, and evaluate its supply chain, where a single disruption to one component can affect all. This research effort will investigate the relationships, coordination strategies, and methods used by organizations as members of a supply chain in dealing with disruptions.

Interdependence and Coordination

The first portion of this effort approaches the study of supply chain risk and interdependence using systems theory, and more specifically, the application of Thompson's Level Model (Thompson, 1967; von Bertalanffy, 1951). Poist (1986) traces multiple approaches of the design and management of logistics systems from individual stove piped components through various cost approaches to a "Total Enterprise Approach." Poist goes on to state that following the logic of a systems approach; the aim is to optimize the overall system rather than to optimize any individual component or subsystem. He emphasizes that careful consideration must be given to the inter-functional tradeoffs, or interdependencies, for the long-term success of the organization. Building on this point, Bowersox, Daugherty, Droge, Rogers, and Wardlow (1989) state that viewing an enterprise as a total system of goal-directed action is essential to maximize competitive impact. The application of system thinking brings an increased

emphasis on inter- and intra- functional integration and coordination (Bowersox & Daugherty, 1987; La Londe, 1986). Therefore, the purpose of this study is to contribute to the body of knowledge regarding interdependencies in the supply chain, and management methods from both a theoretical and application perspective. The unique contribution of this study is examining the impact of interdependency on today's supply chains and then applying the perspective of coordination as a coping mechanism. This study adds to the theoretical underpinning by applying systems theory, and more specifically the elements of interdependencies, coordination, and communication.

Contingency Planning

Recent studies focusing on transportation delays and port stoppages (Chapman, Christopher et al., 2002), accidents and natural disasters (Cooke, 2002), poor communication, part shortages, and quality issues (Craighead, Patterson et al., 2006), operational issues (Chopra & Sodhi, 2004), labor disputes (Machalaba & Kim, 2002), and terrorism (Sheffi, 2001) have documented the impacts of disruption on supply chains in nearly every industry and market segment. Several studies, including Fawcett, Calantone, and Smith (1996), Goldsby and Stank (2000), Fredricks (2005), and Swafford, Ghosh, and Murthy (2006) found that organizations characterized by higher levels of flexibility are more capable of responding to unexpected events such as a disruption in a more successful manner when compared to their non-flexible counterparts.

The emergence of flexibility as an important strategic capability has created a need to gain a better understanding of the relationship between contingency planning and organizational flexibility (Fawcett et al., 1996). This need is even more important in today's global business environment. Therefore, the second portion of this research

effort is a study of contingency planning and risk mediation and is designed to contribute to the growing body of evidence on the importance and impact of disruptions in organizations. As a result, the goal of this study is to examine the planning process and assess its impact on organizational flexibility. While the number of studies into disruptions is growing, there is still a limited amount of progression towards scientific theory-building, as well as limited studies on descriptive/prescriptive information for managers (Craighead et al., 2007). This section applies contingency theory and effective planning attributes as the basis for the development of a theoretical model of the impact of contingency planning on organizational flexibility.

The study of risk, interdependence, and the associated impact of disruption is a growing area of interest to many as they strive to reduce their organization's risk of disruption. Managerial efforts to combat the effects of disruption are nearly as plentiful, but few are researched beyond their day-to-day application. The emergence of contingency planning as a method of managing potential disruption has created a need to gain a better understanding of the incorporation of contingency planning into an organization's processes.

Every organization is driven to survive the forces exerted by its environment. This drive forces organizations to continuously search for new processes and strategies to adapt to the ever-changing business environment (Ehigie & McAndrew, 2005). McLoughlin and Harris (1997) add that successful organizations must utilize innovation as the key element of management initiatives and practices. The use of contingency planning as an organizational management practice to enhance supply chain performance is analogous to the adoption of an innovation.

Innovation

An innovation has been described as an idea, a product, a technology, or a program that is new to the using entity (Cooper & Zmud, 1990; Rogers, 1995). The process need not be new, as in a new invention, but may be new to the organization, or in fact, a new application of something that is already known (Rogers, 1995). Contingency planning has languished as a emergency response tool, often out of date and of little use when really needed (Facer, 1999). Recent natural disasters and cowardly terrorist actions have brought the need for contingency planning to the forefront for many organizations (Alonso, Boucher, & Colson, 2001; LeBras, 2004). Based on the "rebirth" in awareness of the importance of contingency planning and the ever-increasing awareness of supply chain vulnerability, the contingency planning process qualifies as an organizational innovation. Therefore, the third portion of the research in this effort seeks to understand the diffusion of the contingency planning process in organizations where supply chain management is central to the operational effectiveness of the organization.

This study of the adoption of planning and examining diffusion is designed to contribute to the growing body of evidence on the importance of contingency planning in supply chain management (SCM). As a result, the goal of this study is to examine the contingency planning process and the adoption of the process by organizations by utilizing Rogers' innovation characteristics (Rogers, 1995). While the number of studies of innovations within the supply chain is growing, there is still a limited amount of progression towards scientific theory building. Flint et al. (2005) add that the notion and components of innovation need to be explored in greater detail, both breadth and depth.

As previously mentioned, this research effort is actually a compilation of

three closely related research efforts. The first study proposes multiple levels of interdependence experienced by organizations within a hypothetical supply chain. The study goes on to describe potential coordination strategies that allow an organization, or component of an organization, to cope with their interdependence. The application of these coping mechanisms is especially important in the face of supply chain disruptions.

The second phase of the research effort focuses on one method of coordination, specifically, the contingency planning process used by an organization to prepare for and face disruptions as they occur. This effort investigates the specific characteristics of contingency planning that provide that largest contribution to organizational flexibility. Organizational flexibility as an organizational trait allows the organization to alleviate problems generated due to interdependence.

The third portion of the umbrella research effort addresses contingency planning as an innovation. Based on the research in section two, contingency planning is a useful coordination technique for dealing with supply chain disruptions. If so, the next step is how to ensure that the planning technique is used across the organization. Specifically, the research explores the contingency planning process attributes that will most likely lead to successful innovation diffusion across the organization.

The rest of this paper is organized as follows. Chapter 2 is entitled "Towards a Theoretical Model of Supply Chain Interdependence and Coordination Strategy" and represents the first phase of the research effort describing the relationships and coordination strategies found in supply chains. Next, the chapter entitled "Toward the Development of a Contingency Planning Model" focuses in on a specific method of organizational coordination. The fourth chapter, "An Application of Innovation

Diffusion to Supply Chain Contingency Planning," explores what leads to successful planning process diffusion in an organization. The final chapter includes a summation of the most important results of the study, limitations of the current effort, and opportunities for future research.

CHAPTER 2: TOWARDS A THEORETICAL MODEL OF SUPPLY CHAIN INTERDEPENDENCE AND COORDINATION STRATEGIES

Abstract

While technology enabled-coordination is central to supply chain management, there is a lack of a prescriptive view present in the literature. This effort seeks to explore the possible fundamental causes of supply chain disruption and potential methods of combating them. Interdependence is identified as a cause of supply chain disruption and three propositions are made identifying levels of interdependence. Next, coordination is identified as a coping mechanism, with multiple levels proposed to match the experienced level of interdependence. The paper provides a conceptual/theoretical foundation to enhance the body of knowledge related to supply chain interdependence and technology-enabled coordination. The application of Systems Theory, and specifically Thompson's Levels, allows for the development of a framework for managing the interdependence between components within the supply chain as well as the increased risk of a disruption caused by the increased levels of interdependence.

Introduction

The management of a supply chain is an ever-increasing challenge in today's competitive business environment. Higher levels of uncertainty in supply and demand, shorter technology and product life cycles, globalization of the market, and the increased use of distribution, manufacturing, and logistics partners result in a complex international

supply network. Increased levels of complexity and interdependency lead to increased levels of risk in the supply chain (Christopher, 2002). Studies investigating the techniques used to manage these issues cover a wide range of topics, including risk management, operational strategies, proactive management, supply chain design, and improved confidence (Croxton et al., 2001; Lowson, 2002; Sinha et al., 2004).

An organization must continuously identify, measure, and evaluate its supply chain, where a single disruption to one component can affect all the others. Disruptions are unplanned events that might affect the normal, expected flow of materials, information, and components (Svensson, 2002), and are recognized as an inevitability within a supply chain. It is not a matter of if a supply chain will encounter a problem, but rather a matter of the timing and severity of the event.

The study of risk, interdependence, and the associated impact of disruption is a growing area of interest. Recent studies focusing on transportation delays, port stoppages, accidents, natural disasters, poor communication, part shortages, quality issues, operational issues, labor disputes, and terrorism have documented the impacts on supply chains in nearly every industry and market segment (Chapman, Christopher et al., 2002; Chopra & Sodhi, 2004; Cooke, 2002; Craighead et al., 2007; Machalaba & Kim, 2002; Sheffi, 2001). While the number of studies is growing, there is a limited amount of progression towards scientific theory-building, as well as limited studies on descriptive/prescriptive information for managers (Craighead et al., 2007).

We approached this study of supply chain risk and interdependence using systems theory, and more specifically, the application of Thompson's Level Model (Thompson, 1967; von Bertalanffy, 1951). Poist (1986) traces multiple approaches of the design and

management of logistics systems from individual stove piped components through various cost approaches to a "Total Enterprise Approach." Poist goes on to state that following the logic of a systems approach, the aim is to optimize the overall system rather than to optimize any individual component or subsystem. He emphasizes that careful consideration must be given to the inter-functional tradeoffs, or interdependencies, for long term success of the organization. Building on this point, Bowersox et al. (1987) state that viewing an enterprise as a total system of goal-directed action is essential to maximize competitive impact. The application of systems thinking brings an increased emphasis on inter- and intra- functional integration and coordination (Bowersox & Daugherty, 1987; La Londe, 1986). Therefore, the purpose of this study is to contribute to the body of knowledge regarding interdependencies in the supply chain, and management methods from both a theoretical and application perspective. The unique contribution of this study is examining the impact of interdependency on today's supply chains and then applying the perspective of coordination as a coping mechanism. This study adds to the theoretical underpinning by applying systems theory, and more specifically the elements of interdependencies, coordination, and communication.

The next section of this chapter outlines the theoretical foundation for the research effort, followed by a literature review of the relevant areas. Following is the conceptual development of propositions including discussion of the application of Systems Theory, the levels of interdependence, the coping mechanisms associated with interdependence, the elements of coordination, and the characteristics of communication. The final section provides discussion and conclusion with managerial implications and areas for future research.

Theoretical Foundation

Systems Theory provides the premise that organizations, like other natural systems, are open, and therefore provide and receive influence from their environment (Katz & Kahn, 1978). Logistics research and supply chain research have been influenced by economic, behavioral, and organizational theory (Mentzer & Kahn, 1995), providing precedence for the application of theories from outside research disciplines (Stock, 1997). The application of systems theory to supply chain research is consistent with the work of others, including Craighead et al. (2006), Peck (2005), Zsidisin, Ragatz, and Melnyk (2005), Christopher (1971), and Gregson (1977).

In viewing an organization as an open system, we must then acknowledge the impact of the organization's environment, both internal and external. The internal environment includes members of the firm's immediate supply chain such as suppliers, customers, and partners. Typically, the internal environment introduces risk associated with suboptimal interaction, cooperation, and interdependencies between the entities of the chain (Christopher, 2002). The larger "task" environment includes internal aspects, competitors, and the organization's operating environment (Dill, 1958; Scott, 1981). External environmental risks include disruptions caused by labor strikes, terrorism, and natural disasters (Christopher). The level of risk is intensified by the close, dependent nature of many supply chains (Zsidisin, Ragatz, & Melnyk, 2005). The challenge is to facilitate the flow of desired inputs from the environment while preventing negative occurrences from entering the organization (Scott).

Based on the General Systems Theory (GST) work of biologist Ludwig von Bertalanffy, the Open Systems movement created new fields of study, such as

cybernetics and information theory; stimulated new areas, such as systems engineering and operations research; transformed existing disciplines, including the study of organizations; and proposed closer linkages among scientific disciplines. GST is concerned with developing a systematic, theoretical framework for describing general relationships of the empirical world (Johnson, Kast, & Rosenzweig, 1964). Von Bertalanffy (1951) defined the theory "as a formulation and derivation of those principles, which are valid for systems in general, whatever their nature". At its foundation, GST is based on the idea that all systems are open systems, interact with their environment, and must be viewed as a whole, not in subcomponents (von Bertalanffy, 1956).

System thinking has also been applied in a business context. As a continuation of organizational integration, the aim of systems theory for business is to develop an objective, understandable environment for decision-making (Johnson et al., 1964). This means the system should support decision makers by providing a framework for components of the organization, including decision makers and workers. This framework may include aspects of mechanical, organic, and social processes and the corresponding compounding interdependencies. The business organization has dynamic interaction not only with its environment—customers, competitors, suppliers, etc., but also within itself—other departments, subsidiaries, and components of the firm (Johnson, Kast, & Rosenzweig, 1963). This description matches that of the open system, which maintains a constant state while material and energy are transformed and the organism affects, and is affected by, the environment (von Bertalanffy, 1950).

All systems are made of interrelated components (Scott, 1981). The parts that make up systems vary from simple to complex, from stable to variable, and from resistant to outside force to highly reactive to the same. Scott relates that systems become more complex and variable from mechanical to organic to social. The basis for the increase in complexity is, in part, due to an increase in relationship and interdependence between entities. At the most complex level, an organization must be considered as a whole in which there are various levels of interdependence between its sub-parts (Weiner, 1956). Ashby (1968) and Buckley (1967) add that in comparison to physical and mechanical systems, social organizations are loosely coupled.

GST and Open Systems Theory became the basis of many organization theories as a source to improve the design and classification of organizations. Beer's (1964) classification of systems, Lawrence and Lorsch's (1967b) contingency theory, Aldrich and Pfeffer's (1976) environmental models, Weick's (1969) model, Etzioni's (1964) structuralist models, and Thompson's (1967) Levels model built upon each other's work plus the previous work on open systems. For example, in Lawrence and Lorsch's Contingency Model (1967b), they argue that an open system perspective must be taken as the more comprehensive framework, as compared to rational and natural systems. An open system view allows for an understanding of how the organization reacts to its environment (Lawrence & Lorsch, 1967b). Beer proposed a classification of systems ranging from simple and deterministic, to complex and probabilistic, to exceedingly complex and probabilistic. Complex systems cannot be understood by an analysis that attempts to decompose the system into its individual parts (Scott, 1981).

Systems Theory has a solid foundation in logistics and supply chain research as well. Bowersox (1969) argued against the traditional viewpoint of addressing each individual activity as a singular entity. Instead, he proposed that physical distribution, later known as logistics, and a forerunner of supply chain management, be viewed from an overall systems perspective. Systems thinking has continued to influence logistics both from a research and applied perspective. Bechtel and Jayaram (1997) present a framework for determining the degree of systems thinking in logistics research. Further, the systems approach is often used in the definition of supply chain management. This supports a holistic viewpoint of the entire supply chain and is necessary to improve long-term, system-wide performance (Mentzer et al., 2001).

Two particular research efforts provide excellent examples of the application of systems thinking to supply chain management. The first sought to provide an understanding of the supply chain management concept (Cooper, Lambert, & Pagh, 1997). This literature review-based effort focused on the development of a definition and framework for supply chain management. While not specifically referenced as applied systems theory, the framework developed by the study depicts supply chain management as a system of interconnected elements, processes, structures and components. The Cooper et al. article constantly uses systems language emphasizing that supply chain management must recognize that the entire chain is sub-optimized when individual components attempt to optimize individually (Gammelgaard, 2004). Another study that applies the system approach, conducted by Lambert, Cooper, and Pagh, (1998), builds upon previous work by developing and presenting multiple case studies analyses in order to depict general supply chain models. These models depicted the supply chain by using

a holistic view, moving above the individual components. Table 2.1 provides a very brief listing of some prominent supply chain related research utilizing systems theory.

Table 2.1

Prominent Supply Chain Related System Theory Applications

Author(s)	Finding
Johnson, Kast, and Rosenzweig, 1964	Identified the need for interdependent organizational process views
Bowersox, 1969	Argued that physical distribution, later known as supply chain, process must be viewed from a systems perspective
Cooper, Lambert, & Pagh, 1997	Developed supply chain framework that depicts the supply chain as interconnected. Uses systems language to emphasize the system impact of component sub-optimization.
Lambert, Cooper, & Pagh, 1998	Developed general supply chain models above the component level
Mentzer et al., 2001	Identified holistic view impact on system performance

As previously discussed, systems theory places heavy emphasis on the integration and relationship between components within the firm, as well as the relationship between the firm and its environment. In a supply chain context, the definition of the component is expanded to include suppliers and customers. The term component, generally used to describe a single entity within a whole system, can be used to describe a division or section in a company, or an entire company within a supply chain. Supply Chain Management (SCM) is an integrating function with the responsibility of linking major business functions within and across organizations (CSCMP, 2005). Mentzer et al. (2001) characterize SCM as a philosophy that includes a systems approach with strategic

orientation toward cooperative efforts converging intra-and inter-firm capabilities. SCM encompasses activities previously associated only with individual functions such as logistics, operations management, and procurement (Monczka, Trent, & Handfield, 1998; Semchi-Levi, Kaminsky, & Semchi-Levi, 2000) and the functional integration of those activities (Cooper & Ellram, 1993; Cooper, Lambert et al., 1997; Ellram & Cooper, 1990).

Firms must be willing to work together within the supply chain setting, but simply working together may not be enough to ensure success. Collaboration is characterized by a higher level of mutual interest, representing an affective, volitional, shared interest process (Appley & Winder, 1977; Tjosvold, 1988; Tjosvold & Weicker, 1993). Lorsch and Lawrence stress the importance of the shared interest by including the term "unity of effort" in their definition of integration (Lawrence & Lorsch, 1967a). There must be some form of investment in the relationship that includes mutual understanding, a common vision, shared resources, and achievement of collective goals (Mentzer & Kahn, 1995). Many studies have investigated the components of this relationship: (a) trust (Morgan & Hunt, 1994), (b) credibility (Anderson & Narus, 1990), (c) commitment (Dwyer, Schurr, & Oh, 1987), and (d) collaboration (Stank, Keller, & Daugherty, 2001). SCM generally involves the integration, coordination, and collaboration of planning and controlling the procurement, inventory, production, and transportation activities across organizations and throughout the supply chain from the origin of raw material to consumption of the final product (Stank et al., 2001). The next section of this paper includes a discussion of interdependence, coordination, and communication.

Conceptual Development

Level of Interdependence

Pooled interdependence. Thompson (1967) proposes three levels of interdependence. He acknowledges that interdependency does not necessarily mean a direct relationship, but could also include indirect support between components. The classic bank branch example demonstrates this concept perfectly. The Red branch of a firm may not interact with the White branch and neither of the two may interact with the Blue, yet they are still interdependent on one another. The firm, from an organizational perspective, depends upon the performance of all components. Since the branches utilize common resources (e.g. brand name and financial underwriting), the quality and availability of these resources affects all units within the organization. To the extent that each branch can affect the reputation of the firm and ultimately the survival of the organization, each unit is dependent on the others. Each subcomponent contributes to the whole, and depends upon the whole for individual survival. This defines the first level, pooled interdependence.

According to Thompson, this weakest form of interdependence is a situation where each part renders a discrete contribution to the whole and supports the whole. This process could include a physical product, or simply the contribution of information and knowledge. In this case, interdependence involves contributions by loosely coupled agents (Astley & Zajac, 1991). Due to its lack of direct links between components, this level is more akin to independence (Van De Ven & Delbecq, 1976). Malone and Crowston (1994) continue this vantage by defining pooled interdependence as the

situation where activities share or produce common resources but are otherwise independent.

These three definitions share a common thread. The first shared element, stressed by Thompson, Van de Ven, and Malone and Crowston, is the lack of direct interdependence between components. In all three cases, pooled interdependence is characterized as creating indirect links that only arise when the organization produces as a whole or when the product, be it physical or service, is viewed in total. The second key aspect is that one component does not directly influence the actions taken by, or available to, another part of the organization. This emphasizes the independence of action between units and demonstrates that interdependence only arises through the combination of actions at a higher level.

Additionally, since there is no direct dependence between the components, the order of activity, or which component acts first, does not affect the individual or total outcome. In this case, there is no impact on the larger organization, or on the individual components, or parallel or sequential operations and inputs. In simple terms, if node B and node C of the supply chain provide direct input to node A, but have no direct impact on one another, then nodes B and C are involved in pooled interdependence. This level is depicted as the relationship between nodes B and C in Figure 2.1.

In summary, the characteristics of pooled interdependence are independence of action, interdependence at the organizational level, and interdependence not affected by order of action. While these three definitions focused on interdependence within firms, the same framework has been applied inter-organizationally as well (Gulati & Singh, 1998).

Sequential interdependence. Thompson's (1967) second level of interdependency is sequential interdependence. This form of interdependence between components within a firm involves a direct relationship ordered in a serial fashion: the input to one component is the output to another. Therefore, in contrast with pooled, sequential interdependence has both a direct interdependence and an order aspect. Malone and Crowston (1994) focus on the ability of individual components of an organization to take action by defining sequential interdependence as a situation where some activities depend on the completion of others before beginning.

These two definitions help us to identify the key characteristics of sequential interdependence. First, as would be expected, an element of time is included, and the order of operation, or action, now matters. The temporal element is important because of the interdependence of action, where the action of one component drives the action of another. The activity of a component is not only driven by the actions of another component, but may also dictate the action available to another component. Using nodes A, B, and C again, we see that if node B of the supply chain provides an output that is a primary input to node A, and their actions require a temporal element (schedule), then nodes B and A are involved in sequential interdependence. This level is depicted as the relationship between nodes B and A in Figure 1.

Borrowing from Thompson's manufacturing setting (1967) we provide the following example to help explain his definition. Company Alpha produces parts that become inputs for the Beta Assembly Operation. Alpha must meet its obligation; fill the order for Beta, in order for Beta to continue assembly. Additionally, Beta must continue assembly, and therefore continue making and receiving orders from Alpha, or Alpha will

have an output problem. Almost any supply chain provides a perfect example of sequential interdependence. Each step in the chain must provide output and receive input, both for the survival of the component and the overall "organization." The primary source of value found in typical buyer-seller relationships normally stems from sequential interdependence (Borys & Jemison, 1989). While individual components, or functions, attempt to optimize sequential operations and support processes within the supply chain, the systematic nature of the supply chain provides a governing mechanism, or control, across the supply chain.

Another excellent example is the movement of international cargo. The flow of mail, packages, and bulk cargo with sequential transactions from its origin to the destination can often involve domestic truck, domestic freight forwarding, international air transport, foreign freight forwarding, and foreign trucking. The output of one stage, the movement of a package, becomes the input for another, the receipt of a package at a freight forwarding facility. The benefit of sequential interdependencies is not only derived from the potential logistics optimization of each component, but in sequential improvements across the system such as a reduction in transaction costs (Wada & Nickerson, 1998). This example focuses the three key aspects of sequential interdependence: order, interdependence of action, and interdependence between components.

Reciprocal interdependence. The third form of interdependence identified by Thompson (1967) has been labeled reciprocal, which refers to situations where the outputs of each component become the inputs for the others. The key difference in reciprocal interdependence is that the input-output exchange can move in both directions.

The transformation process is termed reciprocal because the transformation requires the object to go through a series of input-output-input exchanges between components (Lemak & Reed, 2000). Malone and Crowston (1994) similarly define reciprocal interdependence as a situation where each activity requires inputs from the other. Consequently, components of the organization are mutually dependent on the decisions and actions of the others. Returning to nodes A, B, and C we find that if node A of the supply chain provides a primary output as the primary input to node C, and node C then provides an output that serves as an input back to node A, then nodes A and C are involved in reciprocal interdependence. This level is depicted as the relationship between nodes A and C in Figure 1.

Thompson (1967) illustrates this level with his example of an airline. The airline contains both operations and maintenance divisions. The maintenance division provides input, repaired aircraft, to operations, which provides input for maintenance, aircraft in need of repair. An emergency room provides another excellent setting to demonstrate reciprocal interdependence. The input to the system, a patient, is admitted to the emergency room, sent to X-ray, moved to surgery, then anesthesia, back to X-ray, back to surgery, and finally to a recovery room. The patient provides the communication, or feedback, mechanism that tells the organization which component is next. As previously stated, the action of each component is dependent on actions taken be the previous; surgery cannot act until it receives input, both action and knowledge, from X-ray, and in turn provides X-ray with input once the surgery has been complete.

A strategic alliance, in which parties seek to broaden or deepen their skills, or to develop new skills together, is an example of inter-organizational collaboration involving

reciprocal interdependence (Gulati & Singh, 1998). In addition, organizations characterized by shared culture; identity and norms create reciprocal interdependencies through the development of dense networks (Dyer & Nobeoka, 2000).

Utilizing the definitions and examples above, reciprocal interdependence has several of the features of sequential interdependence. In both cases, the actions of components are linked, there is interdependence in action and the interdependence is direct. The unique aspect of reciprocal interdependence is the fact that components can affect outcomes repeatedly and that, unlike sequential interdependence, their role may not be completed once they have acted. This important element differentiates reciprocal interdependence from sequential interdependence; each component has more than one opportunity to take action that directly affects others who will then take actions that affect the first.

All organizations have pooled interdependence, more complicated organizations have sequential as well as pooled; and the most complex organizations have reciprocal, sequential, and pooled (Thompson, 1967). Since the levels build upon each other, knowing that an organization contains sequential interdependence tells us that it also contains pooled interdependence. Lower levels of interdependence means that units can do the work independently, and have little need for interaction, consultation or exchange (Daft, 2001). Given that assumption, higher levels of interdependence require increasing levels of interaction, consultation, and communication. Figure 2.1 graphically depicts the three levels of interdependence in a simple three-node supply chain.

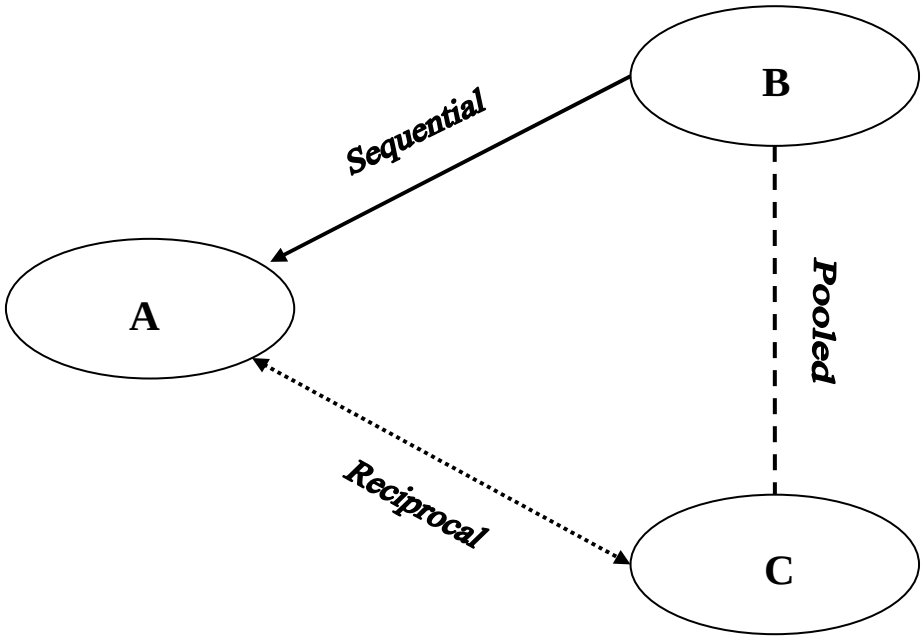

Figure 2.1. Interdependence Levels

This foundation in the categories of interdependence leads us to our first proposition. Based on the definition of supply chain management as "the material and informational interchanges in the logistical process stretching from acquisition of raw materials to delivery of finished products to the end user", and the assumption that all vendors, service providers and customers are links in the supply chain (CSCMP, 2005; Gibson, Mentzer, & Cook, 2005), we make the following proposition.

Proposition 1. *Supply chains include at least one of the three levels of interdependence (pooled, sequential, or reciprocal).*

Coping Mechanisms

The three types of interdependence are increasingly difficult to coordinate because they contain increasing degrees of uncertainty, risk, and disruption (Thompson,

1967). In pooled interdependence, a component can act with little regard to action, or potential action, taken by another component as long as there is no negative impact to the overall organization. At the next level, sequential interdependence, however, each component in the process must readjust if one component acts out of order, thereby increasing the level of uncertainty to the system. In the third level, each component must readjust after every action and uncertainty is very high. To deal with the increasing levels of uncertainty, an organization must develop a coping mechanism.

Thompson (1967) identified the coping mechanism as coordination with each level of interdependence matched to a degree of coordination. He argued that in a situation of interdependence, concerted action comes about through coordination. Coordination is defined depending on context, but here it can be defined as "managing dependencies among activities" (Malone & Crowston, 1994). Coordination mechanisms create lateral linkages across components to facilitate communication and linked action. They also facilitate interactions between units in order to pool knowledge and develop language standards that are needed for cross-unit sense making (Daft & Weick, 1984; Galbraith, 1993). Given the three levels of interdependence described previously, we would expect to find different levels of coordination. Thompson borrowed from the framework of March and Simon (1958) to develop his own: these coordination methods include standardization, plan, and mutual adjustment.

Coordination by standardization. According to Thompson (1967), standardizing rules and sharing mechanisms is the best way to manage the first level, or pooled interdependence. This coordination by standardization involves the establishment of routines or rules which limit the activities of each component. These standards regulate

interactions, ensuring that each unit within the system remains in line with other components. Coordination by standardization lends itself to stable problems of pooled interdependence: providing interdependent units rules and procedures for behavior allows the components to act while still meeting the needs of the overall organization.

This method minimizes the need for communication between individuals and instead encourages individuals, and components, to follow the previously established guidelines. A financial exchange provides a good example of this mechanism. Contracts and negotiation rules are clearly defined in advance to allow trade at low cost and with minimum interdependence (Domowitz, 1995). Thompson (1967) points out that coordination by standardization requires an internally consistent set of rules and stable, repetitive situations. Another good example of coordination by standardization is a military contingency. All units are dependent upon one another in some fashion, each with their own responsibilities toward meeting an ultimate goal. Standardization allows the units, or components, to operate with the knowledge that other organizations will do what is expected, when it is expected, without additional coordination or communication between the units. The components themselves provide oversight to ensure compliance. In this example, there are potentially thousands of individual links that could be connected without the assumption of standard processes across the organization. This allows the individual experts to act independently, especially in time sensitive situations.

In summary, coordination by standardization best supports the lowest level of interdependence. It requires little knowledge sharing between components due to its routinized nature. In fact, the routine nature of this level impedes knowledge sharing (Rivkin, 2000). Each unit acts and reacts the same way as a rule. Information sharing, or

communication, is less important between components. The units know what to expect and have previously agreed upon the standards used. Finally, timing of individual action is not important. Since each component provides a standard product to a shared pool, coordination of timing is not considered.

Coordination by plan. The second level identified by Thompson (1967) is coordination by plan. This type of coordination involves the development of detailed schedules. The schedule governs the independent actions of the components and therefore lends itself to sequential interdependence. Coordination by plan does not require the same high degree of stability and routinization required by coordination by standardization and allows for change, especially when the organization's external environment changes (March & Simon, 1958). This type of coordination brings to bear the involvement of a coordinator, manager, or planning agent. In order to be effective, the coordinating agent plans the flow of products and information. This enables the components to adapt to changes in their environment. Use of coordination by plan allows components to take independent action with a better understanding of what happened before and what will happen after their involvement. This aspect of coordination by plan introduces the concept of a larger shared goal (Galbraith, 1977).

A simple example of the utilization of coordination by plan is the common assembly line. The actions of each component are dependent upon the input of others; in addition, their outputs drive further action by other components. Time, or order, has become very important to the overall process. Many actions depend on the single action of one unit. Similar to coordination by standardization, the role of knowledge, or knowledge sharing, and communication are very important. In this case, the level of

knowledge sharing and communication increases between components over coordination by standardization as there is a need to let the next component know what will happen. The components must also share basic knowledge of the processes to be used, and communicate in the agreement of developing the plan. This form of coordination, typically seen in the supply chain, occurs when managerial discretion is required in order to improve operations and production (Beamon, 1998). The shipping industry also demonstrates a classic example of the level of coordination. The management of courier services requires a central planner, who not only defines schedules, routes and transport modes, but also contractual arrangements to coordinate sequential transportation stages from the sender to the recipient (Wada & Nickerson, 1998).

In sum, coordination by plan requires increased levels of knowledge sharing and communication. While the element of standardization still exits, coordination by plan requires a defined schedule and acknowledgement of reaction to the inputs of each subcomponent and the organization's environment.

Coordination by mutual adjustment. The final coordination method identified by Thompson (1967) is mutual adjustment. This method adds the transmission of new information during the process of action and fits best in situations involving higher levels of variability and unpredictable situations. Thompson claimed reciprocal interdependencies require the transmission of new information through mutual feedback processes. The difference between coordination by plan and coordination by mutual adjustment is the implication of joint problem solving and decision-making rather than a central planner. This results in group-based decision-making (Van De Ven & Delbecq, 1976).

Reciprocal interdependencies and the resulting mutual adjustment coping mechanisms can be quite complicated. Social networks provide an excellent opportunity to observe this level of coordination. In these intertwined situations actions, reaction, communication, and the sharing of knowledge occur between components, and between individuals within those components. Again, in a stepping stone manner, the role of communication and knowledge sharing increases. At this level of coordination, each component must have a clear understanding not only of what has happened (actions of a previous component), but what will happen next (actions that should take place). In order to choose the appropriate action with an understanding of what their own actions will produce requires high levels of knowledge sharing and communication. The increase in communication is due to the feedback mechanism found in the reciprocal nature of the relationships between components. Powell (1990) states that in actions and reactions, neither occurs through discrete exchanges as in coordination by standardization, nor by administrative control as in coordination by plan, but through networks of individuals engaged in reciprocal, preferential, mutually supportive actions.

The formation of relationships between components, and individuals, is a developing process rather than planned. It develops over time based on experiences, through the new feedback element, and continues to change with each action. Gulati and Gargiulo (1999) found past transactions provide crucial information about performance and conduct. This information is used to make future decisions and forms a continuous feedback loop, fostering additional learning and shared knowledge between components (Powell, Koput, & Smith-Doerr, 1996).

Coordination by mutual adjustment is characterized by a constant feedback between components. As the complexity of the relationship between components increase with levels of interdependence, so does the need for increased communication of knowledge sharing. This increased level of communication provides for the continuous sharing of knowledge between components, which in turn provides components with the ability to manage risk and disruptions. In highly variable situations, the coping method provides the visibility and flexibility necessary for independent actions by components to blend towards an organizational goal. The feedback process governs timing of action and modifies any previously agreed upon schedule. Figure 2.2 depicts the levels of interdependence with associated coordination method.

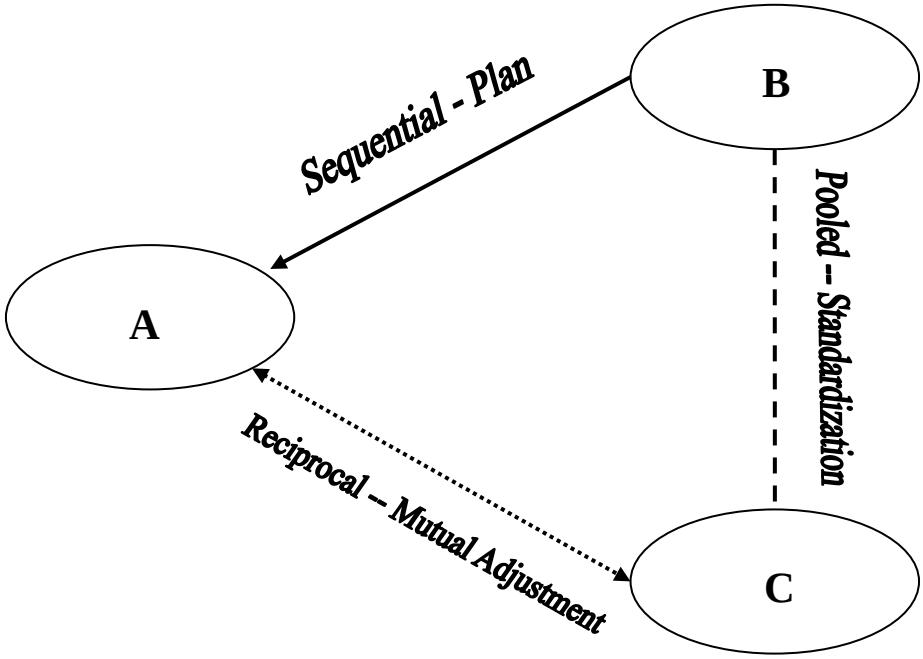

Figure 2.2. Coordination Methods

Given the assumption of interdependence within the supply chain, and the assumption that components of an organization must somehow cope with that interdependence, we can make the follow propositions.

Proposition 2. *Components, or nodes, within a supply chain must coordinate in order to cope with their interdependencies, especially when a disruption occurs.*

This proposition can be broken down into three categories to match Thompson's Levels of Interdependence.

Proposition 2a. *Nodes within a supply chain that operate in an environment of pooled interdependence will best cope with their interdependencies and disruptions when they utilize coordination by standardization.*

Proposition 2b. *Nodes within a supply chain that operate in an environment of sequential interdependence will best cope with their interdependencies and potential disruptions when they utilize coordination by plan.*

Proposition 2c. *Nodes within a supply chain that operate in an environment of reciprocal interdependence will best cope with their interdependencies and potential disruptions when they utilize coordination by mutual adjustment.*

Discussion and Conclusion

Several streams of research are concerned with Systems Theory, Supply Chain Management, and the impact of supply chain disruptions, each providing its own theoretical and empirical contribution. These efforts, however, have stopped short of the specific development of a framework for identifying and managing interdependence. As systems progress from simple to complex, the flow of material becomes more complicated. Input and output of the business system is generally associated with funding and information, which includes knowledge sharing. While the number of components

obviously varies from system to system, the shared characteristic is the dependence between and across the subcomponents. It is this interdependence, or rather the degree of interdependence, which determines the level of integration of the firm. The level of interdependence also drives the coordination method the firm utilizes to deal with uncertainty.

This study has contributed to a better understanding of the level of interdependence within a supply chain, the coping mechanism (coordination) required to effectively manage interdependence, and the communication characteristics of each level of coordination. The application of Systems Theory, and specifically Thompson's Levels, allows for the development of a framework for managing the interdependence between components within the supply chain as well as the increased risk of a disruption caused by the increased levels of interdependence. This framework adds to the body of knowledge regarding supply chain disruptions, risk, and management methods from both a theoretical and application perspective. The unique contribution of this review is viewing the impact of disruptions on today's interdependent supply chains and then applying the perspective of coordination as a coping mechanism. This review adds to the theoretical underpinning by applying systems theory, and more specifically the elements of interdependencies, coordination, and communication.

As an intermediate step to theory development, there are, of course, limitations to this review's perspective. The primary limitation deals with generalizability. While Systems Theory and the brand theory of Thompson's Levels Model are by their very nature generalizable, there may be exceptions or additions to the types of interdependence found within a supply chain. Additionally, there may be additions to the

types of coordination and the characteristics of the matching level of communication. As this research area expands, future research efforts may demonstrate new methods of coordination and improved technology for communication, thereby expanding this basic framework.

Managerial Implications and Contributions

The framework proposed in this research effort supports supply chain managers by providing a basic framework for decision-making and comparison. Based on the descriptions, definitions, and examples provided, the framework can assist managers in identifying their organization's level of interdependence, matching levels of required coordination, and identifying the most appropriate communication characteristics to address.

In a more general sense, this framework expands logistics and supply chain theory by applying Systems Theory, specifically Thompson's Levels Model. Compared to older, more established academic disciplines, logistics does not have as rich a heritage of theory development and empirical research (Stock, 1997). As a social science, Bergner (1981) relates that disciplines are not thought to have different "areas" to study. Instead, each research discipline studies the same total social-political-economic-historical reality from its own perspective.

As discussed above, the unique contribution of this paper is in the application and development of theory. Systems Theory and Thompson's Models have been included in many logistics and supply chain research efforts including (a) transportation and distribution center management (Williamson, Spitzer, & Bloomberg, 1990), (b) inter-organizational systems (Fulk & DeSanctis, 1995; Goodhue, Wybom, & Kirsch, 1992;

Kumar & van Dissel, 1996), (c) corporate vulnerability (Svensson, 2004), (d) information flow optimization (Lewis & Talayevsky, 2004; Markus & Robey, 1988), (e) business process redesign (Kim, 2000, 2001), and (f) transaction cost (Beamon, 1998; Lei & Benita, 2006); however, these efforts have stopped short of a managerial framework.

CHAPTER 3: TOWARD THE DEVELOPMENT OF A CONTINGENCY PLANNING MODEL

Abstract

Contingency planning is a method of dealing with and preparing for interruptions and disruptions to organizational activity. This risk management technique has many attributes that are widely touted as promoting organizational flexibility. The purpose of this study is to examine the relationship between several attributes of contingency planning processes and organizational flexibility. Specifically, the study examines the impact of top management support, information technology usage, process standardization, and both inter- and intra-organizational collaboration on organizational flexibility. This effort develops a model that will provide both academicians and practitioners with a means of determining the attributes with the highest relationship to organizational flexibility. This knowledge will allow for prioritization of resources in the planning process. A cross-sectional survey of 168 contingency planners from a large service organization was used to test the hypotheses listed below. Data was analyzed utilizing linear regression.

Introduction

Recent world events and related research have highlighted the need for effective solutions to organizational activity disruptions. Soon after the September 11 attacks, the Toyota Sequoia plant in Indiana came within hours of halting production due to delays in

the delivery of critical steering sensors (Sheffi, 2001). In a separate instance, fire at a supplier facility forced Toyota to shutdown 18 plants for nearly two weeks in February 1997. The estimated costs of the disruption included $195 million in damage and inventory loss with an additional estimated opportunity cost of lost sales of $325 million on 70,000 cars (Converium, 2006). In another disruption-related business event, during the second quarter of 2001 Cisco simultaneously experienced rapidly weakening demand along with long-term purchasing agreements that combined to result in a $2.5 billion inventory write-off (Spekman & Davis, 2004). In yet another example, a relatively small fire in an Ericsson mobile phone sub-supplier resulted in an estimated $400 million loss primarily due to the loss of the supplier. Ericsson was not able to meet customer demand of its key consumer products during a critical time and lost months of production capability (Norrman & Jansson, 2004).

As illustrated above, an organization must continuously identify, measure, and evaluate its operating environment. Complex organizations are very interdependent, with a single disruption creating a ripple effect that can dramatically impact the entire operation (Peck, 2005). These complex organizations may be a single entity, such as a large corporation, or may exist as a group of entities linked together in a common or shared effort. In the latter case, the group of organizations are often referred to as a supply chain. While there are many technical definitions of a supply chain (Gibson et al., 2005; Mentzer et al., 2001) a simple definition will suffice for the purposes of this study. Christopher (1992) defined a supply chain as the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate

consumer. One preemptive solution to a potential disruption is the establishment of a contingency planning process that enables an organization to be more effective in their prevention of, and response to, a disruption.

The management of a highly interconnected organization is an ever-increasing challenge in today's competitive business environment. Higher levels of uncertainty in supply and demand, shorter technology and product life cycles, globalization of the market, and the increased use of distribution, manufacturing, and logistics partners all result in a complex international network. As the levels of complexity increase and interdependency becomes more prevalent, increased levels of risk occur (Christopher, 1992). Many studies have used a variety of approaches to attempt to investigate the techniques used to manage these complex issues. A wide range of topics, including risk management (Finch, 2004), operational strategies (Croxton et al., 2001), proactive management (Sinha et al., 2004), and supply chain design (Lowson, 2002) have all contributed to the level of understanding of how to manage today's complex and interdependent organizations.

Disruptions

Supply chain disruptions are unplanned events that might affect the normal, expected flow of materials, information, and components (Svensson, 2002), and are recognized as an inevitability within a supply chain organization. Stated differently, a disruption event is the manifestation of risk within the supply chain process. It is not a matter of a supply chain system encountering a problem, but rather a matter of when a problematic event will occur and the severity of the event. Therefore, the study of risk, interdependence, and the associated impact of a disruption on supply chain performance

is a growing area of interest to many as they strive to reduce their organization's risk of disruption.

Recent studies focusing on transportation delays and port stoppages (Chapman, Christopher et al., 2002), accidents and natural disasters (Cooke, 2002), poor communication, part shortages, and quality issues (Craighead, Blackhurst, & Handfield, 2006), operational issues (Chopra & Sodhi, 2004), labor disputes (Machalaba & Kim, 2002), and terrorism (Sheffi, 2001) have all documented the impacts of disruptions on supply chains in nearly every industry and market segment. Several studies, including Fawcett, Calantone, and Smith (1996), Goldsby and Stank (2000), Fredricks (2005), and Swafford et al. (2006) found that organizations characterized by higher levels of flexibility are more capable of responding to unexpected events such as a disruption in a more successful manner when compared to their non-flexible counterparts.

The emergence of flexibility as an important strategic capability has created a need to gain a better understanding of the relationship between contingency planning and organizational flexibility (Fawcett et al., 1996). This need is even more important in today's global business environment. This study of contingency planning and risk mediation is designed to contribute to the growing body of evidence on the importance and impact of disruptions in organizations. As a result, the goal of this study is to examine the planning process and assess its impact on organizational flexibility. While the number of inquiries into disruptions is growing, there is still a limited amount of progression towards scientific theory-building, as well as limited studies on descriptive/prescriptive information for managers (Craighead et al., 2007). Therefore, the current effort strives to use contingency theory and effective planning attributes as the

basis for the development of a theoretical model of the impact of contingency planning on organizational flexibility.

In this effort, the researcher identifies and measures the relationship between key components of the planning process and attempts to assess their relationship with organizational flexibility. For the purpose of this study, organizational flexibility is defined as the ability to adapt to unexpected circumstances and focuses on an organization's ability to encounter, resolve, and when appropriate, exploit an unexpected opportunity (GLRTMSU, 1995).

The next section of this paper outlines the theoretical foundation for the research effort, including a brief literature review and discussion of supply chain disruptions, risk, and contingency planning. Next, the conceptual development section includes hypotheses and discussion of the application of theory and planning components. Finally, the methodology section details how the current research will be conducted and provides a discussion of the results, provides conclusions, identifies managerial implications, and concludes with promising areas for future research.

Theoretical Foundation

Contingency theory implies that firms adapt to changes in their environment by modifying their approach to competition in order to maintain or enhance performance (Hoffer, 1975). The willingness and ability of organizations to deal with changes in their operating environment has been documented as a cornerstone of firm strategy and performance (Hambrick, 1983; Herbert & Deresky, 1987; Porter, 1980). Contingency theory provides a basic rationale for emphasis on flexibility-based strategies that represent a strategic response to emerging threats (Bolwijn & Kumpe, 1990; Fawcett et

al., 1996). Bracker (1980) argued that firms utilize resources as necessary to achieve specified objectives within a specific competitive environment and under specific conditions.

Strategic Planning

The application of strategy and strategic planning processes focuses the organization's resources in a manner that enhances firm performance via a competitive driver, such as flexibility (Fawcett et al., 1996). The importance of strategy can be identified in two primary areas. The first is seen in the identification of the organization's core objectives and thereby its current and future direction. Second, strategy guides the process by which firm resources are developed, organized, and allocated in order to achieve selected objectives (Fawcett et al., 1996).

Contingency theorists have argued that strategic planning linked to performance increases the understanding of the "situational" effects of planning on performance (Egelhoff, 1984, 1985). Wolf and Egelhoff (2002) go on to add that strategic planning fosters a consistent conceptualization of strategic planning characteristics and their relationships to different organizational and environmental characteristics. Lorange and Vancil (1977) stated that strategic planning systems have two major functions: (a) to develop an integrated, coordinated, and consistent long-term plan, and (b) to facilitate long-term corporate adaptation to changes in its external environment. The impact of organizational environment on organizational processes has been extensively studied with emphasis on the need for flexibility and protection from turbulent environmental conditions (Child, 1973a, 1973b; Lawrence & Lorsch, 1967b; Thompson, 1967).

Contingency Planning

The ability to manage disruption and develop plans in case of a contingency involves early involvement of participants (Zsidisin, Melnyk, & Ragatz, 2005) and improved visibility and communication (Christopher & Lee, 2004). Risk management within the organization has placed many professionals in new territory and forced the application of new techniques (Elkins et al., 2005). Previous experiences and training may not have adequately prepared managers to prepare contingency plans (Hauser, 2003). Even when trained in plan development, many organizations lack the ability to modify planning processes to meet their specific needs (Norrman & Jansson, 2004). Clearly, in management and contingency planning, one size does not fit all.

As a better understanding of the causes of risk, including the identification, assessment, and management of risk has been reached, the realization that there is no single method of controlling risk has also been highlighted. Recent studies on situational risk management seek to identify potential methods that are appropriate for specific situations (Giunipero & Eltantawy, 2004; Mabert & Venkataramanan, 1998; Niraj, 2001). Along with the development of new techniques comes the application of models from other disciplines.

As previously discussed, one preemptive measure used by organizations to manage the impacts of risk and associated disruptions is the contingency plan. Contingency planning is a special type of planning that provides a blueprint for responding to the risks associated with an unknown event (La Londe, 2005). La Londe added that a contingency plan should detail a timely and complete response to a specific risk or a cluster of risks.

Clay (1971) made a case for the preparation of contingency plans to anticipate sudden situations that represent either a threat or an opportunity for an organization. A contingency would include a wide range of potential occurrences, including currency devaluation, take-over bids, material shortages, and competitor activities (Clay, 1971). Furthermore, Juttner (2005) reported that many organizations expect vulnerability to increase due to growth in supply chain globalization, reduction in inventory, centralized distribution, supplier base reductions, outsourcing, and centralized production. The increase in risk of disruption is due in part to a move towards leaner organizations.

Today's lean organizations are becoming increasingly fragile and less able to deal with shocks and disruptions that can have a dramatic impact on an organization (Zsidisin, Ragatz et al., 2005). This increase in risk, whether generated by outside environmental forces or as a result of internal process issues, forces organizations to develop formalized plans to deal with potential disruptions. According to the online Merriam-Webster Dictionary, a contingency is "an event, or emergency that may but is not certain to occur," or "something liable to happen as an adjunct to, or result of, something else" (Merriam-Webster, 2007). This definition includes situations where crisis management, disaster planning, or business continuity planning might be used. This research effort will use the term "contingency" to represent all of the aforementioned situations: incorporating business interruption, continuity, crisis, disaster, or emergency situation planning.

The aim of the contingency plan is to minimize potential loss by identifying, prioritizing, and safeguarding assets that need protection with the goal of the organization being able to save valuable resources in the event of a disruption or disaster. Borrowing

from the work of Rice and Caniato (2003), contingency planning means developing a plan to be resilient, or prepared to respond to and restore operations after an unexpected disruption occurs. Barnes (2001) adds that this form of planning is the integration of formalized procedures and resource information that organizations can use to recover from a disaster that causes a disruption to business operations.

Contingency planning has been identified as a crucial issue for many organizations. In the 2003 and 2005 Bain Management Tool Surveys, 70% and 54%, respectively, of companies surveyed cited widespread use of contingency planning within their organizations (Rigby, 2003; Rigby & Bilodeau, 2005). Additionally, the Deloitte and Touche/CPM 2005 Business Continuity Survey found that the number of companies that invested in contingency planning have increased by 53% in 6 years from 30% of those surveyed in 1999 to 83% in 2005 (Deloitte & Touche, 2005). Research involving contingency planning has become widespread across multiple disciplines (Barnes, 2001) including banking (Johnson, 2006), engineering (Bent, 2001), finance (Ferris, 2002; Miller, 2003), insurance (Bandyopadhyay, 2002; Kleffner, Lee, & McGannon, 2003; Shugrue & Dreher, 2006), health care (Iyer & Bandyopadhyay, 2000), manufacturing (Iyer & Sarkis, 1998), supply chain management (Svensson, 2002, 2004), and logistics (Hale & Moberg, 2005). The types of contingencies identified has grown to include more non-traditional disruption causes like natural disasters, terrorist actions, and information technology issues (Alexander, 2006; Anonymous, 1994; Bent, 2001; Fawcett & Cooper, 1998).

Increased Risk

Many companies have increased their dependency on one another in an effort to augment their own internal capabilities. Streamlined efforts result in leaner processes and lead to a reduction in waste and inventory buffers, both of which reduce cost. These actions, no matter how well intended, also have a dark side that can lead to a higher risk of disruption and increase the severity of the disruption (Zsidisin, Ragatz et al., 2005). It is not unexpected to find that there are risks associated with an integrated organization. When an organization makes the decision to give up part of its autonomy by working with other firms, its fortunes meld with its partners (Spekman & Davis, 2004). They are now interdependent which includes opportunities to share both successes and risks. Today, one of the many challenges of organizational management is to plan, control, and monitor the intersections between the organization and its partners. This process creates a boundary that attempts to control the effects of disruption (Sinha et al., 2004).

Risk Management

Because of numerous documented disruptions, interest in risk management research is expanding in both breadth and depth. Part of the reason for the increased level of interest in risk management is that in order to be effective, managers must accurately assess and respond to risk. This assessment includes the identification and monetization of risk events, probability of occurrence, and the firm contingencies for alternative actions. In fact, risk exposure is broader than ever before, and a risk and uncertainty lens is extremely important and useful for supply chain managers (Barry, 2004).

Interest in risk management research is expanding in both breadth and depth. Recent natural disasters such as Hurricane Katrina have highlighted the need for better

disaster preparedness planning (Alff, 2006; Hale & Moberg, 2005). An increase in the number of terrorist acts on civilian business and transportation centers has led to firms planning for when, not if, a disruption will occur. These strategic resilience initiatives are aimed at reducing the vulnerability of a major disruption and increasing the ability of the organization to bounce back (Rice & Caniato, 2003; Sheffi & Rice, 2005). Additional related efforts focus on risk perception (Zsidisin, 2003), as well as identification, and assessment (Chopra & Sodhi, 2004; Zsidisin, 2003; Zsidisin et al., 2004). Regardless of the approach, all of the efforts are focused on the purpose of classifying the risk and its source to evaluate exposure to the firm. With this foundation in theory and planning, we can begin identification of the attributes of flexibility in terms of contingency planning and proceed with hypothesis development.

Conceptual Development

Current trends such as an increase in global markets, increasingly intertwined supply chains, and increased mutual dependence have all highlighted the need for flexibility. However, the importance of flexibility is not a new concept. The Chinese philosopher Sun Tzu captured the essence of the importance of organizational flexibility in stating that "every minute ahead of the enemy, is an advantage" (Sunzi & Clavell, 1981). Generally, flexibility is construed as the ability of a firm to face, and proficiently adapt to, a continuously changing and unpredictable environment (Kassim & Zain, 2004).

In today's global and highly competitive marketplace, flexibility is often characterized as doing things fast, being responsive to the market, or providing a company with the opportunity to pursue innovation and allowing for adaptability to changing circumstances (Bower & Hout, 1988; Goold & Campbell, 2002; Stalk Jr, 1988).

In fact, flexibility is often touted as the ready capability to adapt to new, different, or changing requirements. If flexibility is achieved, it can be the cornerstone of an organization's ability to respond more quickly than competitors, thus placing an organization in a position of competitive advantage (Fawcett et al., 1996). This capability is concerned with the ability to adapt to unexpected circumstances and concerns an organization's ability to encounter, resolve, and exploit an unexpected emergency or opportunity (GLRTMSU, 1995). Flexibility permits an organization to continuously improve customer satisfaction by leveraging routine performance to high levels of non-routine compliance (Bowersox et al., 1992). The following discussion highlights several important attributes of contingency planning processes and describes a potential relationship with organizational flexibility.

Organizational Commitment

As with any organizational process, organizational commitment is an extremely important aspect of program success (Bardi, Raghunathan, & Bagchi, 1994; Murphy & Poist, 1992). Without the in-depth support from the organization, a process, especially one requiring a change in current practices, reallocation of resources, or increased workload, will not be accepted by the members of the organization (Hill & Collins, 1998; Murtha, Lenway, & Bagozzi, 1998). One aspect of organizational commitment is top management support (Fawcett et al., 2006). Top management support often validates a program to other members of an organization (Curtis & Sambamurthy, 1999). The impact and importance of management support is established in Drucker's framework of the theory of business (Drucker, 1969, 1994).

Top management support. The importance of top management support has been identified in studies concerning resource allocation (Akkermans, Bogerd, & Vos, 1999; Cerullo & Cerullo, 2004), successful management initiatives (Fawcett et al., 2006; Marien, 2000), and in contingency planning (Karakasidis, 1997; Zsidisin, 2003; Zsidisin & Smith, 2005). Without planning, support, patience, and leadership from management, many programs can become large drains of time, effort and resources for an organization (Wisner & Lewis, 1997). Wisner and Lewis related that commitment from top management must be continuous throughout the process, or any initiatives will soon be abandoned. Min and Mentzer (2004) reinforced this concept by adding that top level support is a must for successful implementation of management programs. Bardi et al. (1994) added that without top management support, many systems will not develop beyond minimum requirements stage, failing to reach their intended goals of improved efficiencies and potential for achieving a competitive advantage. This study's first hypothesis is based on this expected relationship.

Hypothesis 1: *Employees' perceptions of top management support for contingency planning will be positively related to their perceptions of organizational flexibility*.

Goal alignment. The strategic goals of the firm are important to the contingency planning process. Mutual goals refer to where the organization places emphasis within the firm. This typically takes place through strategy development, corporate values, rules, procedures, and resource allocation (Mollenkopf, Gibson, & Ozanne, 2000). Goal alignment ensures that multiple components are focused on the same, or very similar, process outcomes. The compatibility of multiple functional activities within the organization's planning environment is crucial. The development of mutual goals for the

achievement of integrated planning activities plays an important role in enforcing an organization-wide planning effort (Murphy & Poist, 1992). Siguaw, Simpson, and Baker (1998) referred to this topic as "cooperative norms" and defined it as the perception of the joint efforts of all parties to achieve mutual goals while refraining from opportunistic actions. Cooperative norms reflect expectations the exchanging parties have about working together to achieve mutual goals jointly (Cannon & Perreault Jr, 1999).

Hypothesis 2: *Employees' perception of organizational goal alignment in the contingency planning process will be positively related to their perception of organizational flexibility.*

Resource alignment. Intra- and inter-organizational resource alignment represent the physical and process coordination activities necessary to achieve organizational flexibility (Murphy, Poist, & Braunschweig, 1996). Inter-organizational resource alliances can be a powerful way to gain flexibility, and ultimately competitive advantage (GLRTMSU, 1995). Alliances offer the benefits of joint synergy and planning without the risks associated with complete control and ownership. Each member of the alliance, or supply chain, may take advantage of multiple strengths (Larson, 1994) to address both shared and individual weaknesses (Spekman & Davis, 2004), thereby increasing the level of organizational flexibility (Goldsby & Stank, 2000). The coordination of resources, or resource alignment, in a planning alliance increases organizational responsiveness and flexibility (McGinnis & Kohn, 1990, 1993).

Hypothesis 3: *Employees' perception of resource alignment within the contingency planning process will be positively related to their perception of organizational flexibility.*

Information

An organization's ability to generate, combine, and make use of information is vital. The firm's ability to capture information for use in the planning process is critical to selecting and developing appropriate capabilities to deal with disruptions (Fawcett, Calantone, & Roath, 2000). Organizations need information and the ability to share that information in order to develop contingency plans, to manage the planning process, and to control daily operations (Kaplan, 1991). Central to the ability to plan is the exchange of large amounts of information within and between organizations (Sanders & Premus, 2002). Information is seen as the glue that holds organizational structures together, allowing for agile flexible responses to contingency (Whipple, Frankel, & Daugherty, 2002). The Global Logistics Research Team (1995) identified information technology as an indicator of information's relationship to flexibility.

Information technology. Information technology (IT) capabilities include the application of hardware, software, and networks to enhance information flow and facilitate decisions. IT enables an organization to maintain key information in an accessible format, process requirements, and make operating and planning decisions. Information systems allow an organization to implement strategy and planning by making decisions more quickly (Stank & Lackey, 1997) and improve organizational performance (Sanders & Premus, 2005).

Hypothesis 4: *Employees' perceptions of information technology usage in the contingency planning process will be positively related to their perceptions of organizational flexibility.*

Information sharing. Information sharing is the willingness to make strategic and tactical data available to others involved in the planning process. Open sharing of information provides the glue that holds the supply chain together (Mentzer, 1993). Without adequate communication and information sharing, supply chain members are forced into trade-off situations and must choose between effective and efficient responses to potential disruptions (Mohr & Nevin, 1990). Rather than hoarding and releasing information only to solve day to day problems, organizations must be willing to share information concerning plans, best practices, and potential disruption to prevent problems and to meet customer requirements (Lee, Padmanabhan, & Seungjin, 2004; Stank, Emmelhainz, & Daugherty, 1996).

Hypothesis 5: *Employees' perception of the level of information sharing in the contingency planning process will have a positive impact on their perception of organizational flexibility.*

Connectivity. Connectivity reflects an organization's ability to share and utilize information. It includes the ability to deploy jointly developed or agreed upon information systems such as electronic data interchange or an enterprise resource planning system (Gomes & Knowles, 2004; Hakansson & Eriksson, 1993). Computer systems and information technology provide data for improving decision making and enhancing the planning process through effective resource allocation (Auramo, Kauremaa, & Tanskanen, 2005), organizational alignment (Kent & Mentzer, 2003), and reduced notification time when action is necessary (Auramo et al., 2005). An integrated system of information exchange provides an organization with the means to collect, disseminate, and utilize information in a timely fashion (Stank & Lackey, 1997). Connectivity embodies this overall capability (GLRTMSU, 1995).

Hypothesis 6: *Employees' perception of system connectivity in the contingency planning process will be positively related to their perception of organizational flexibility.*

Planning Process

The process of planning plays a key role in securing increased levels of firm performance and the development of critical capabilities (Fawcett et al., 1996). In fact, the primary purpose of strategy is to identify and select a specific capability to perform a particular function (Stalk Jr, 1988). In this case, contingency planning impacts the development of flexibility by processing information and organizing resources (Bowersox et al., 1989; Fawcett et al., 1996).

Comprehensiveness. The role of planning is to establish the organization's direction by evaluating objectives, alternatives, and the resources (Hayes, Wheelwright, & Clark, 1988). Further, Hayes et al. relate that planning should lead the organization to organize resources in such a way as to reinforce the priorities that a company has placed on certain competitive dimensions. The effective development and allocation of resources is particularly important in complex, changing environments (Fawcett, Stanley, & Smith, 1997). The comprehensive aspect of the planning process assists an organization in the configuration and coordination of operations more effectively and thus increases the level of organizational flexibility (Fawcett et al., 1997; Kuicalis, 1991). A comprehensive plan must follow a formal planning process identified by the organization to ensure appropriate planning aspects and planning steps are included in different functional areas. Formality is the incorporation of analysis of risks and benefits, documentation of alternatives, and communication of organizational objects and strategy (Fawcett et al., 1996). This study borrows from Fawcett, Calantone, and Roath's (2000)

statement that comprehensiveness is the extensive analysis of risks and benefits, documentation of alternatives, and communication of organizational objectives and strategy implementation processes to relevant management levels.

Hypothesis 7: *Employees' perception of the comprehensiveness in the contingency planning process will have a positive impact on their perception of organizational flexibility.*

Standardization of processes. Standardization refers to the establishment of common policies and procedures to facilitate the planning process (GLRTMSU, 1995). Explicit and systematic planning processes have been linked to organizational competitive success (Andersen, 2000; Ansoff et al., 1970; Herbane, Elliott, & Swartz, 2004; Herold, 1972; Peattie, 1993; Wood Jr & LaForge, 1979). Standardization of benchmarked practices ensures that activities that have proven to be successful are utilized throughout the organization. This standardization of benchmarking of the contingency planning process has also been identified as important to competitive success (Bowersox et al., 1989). Standardization of the planning process also ensures shared knowledge, or at least awareness, of the responsibilities and actions of other organizational components (Bartlett & Ghoshal, 1998). Bartlett and Ghoshal go on to add that standardization provides an organization with consistency, or a baseline, used to handle situations ranging from the norm to the unusual.

Hypothesis 8: *Employees' perception of standardization of the contingency planning process will be positively related to their perception of organizational flexibility.*

Collaboration. Knowledge management is defined as a justified belief that increases an entity's capacity for effective action (Huber, 1991; Nonaka, 1994). While

knowledge can be viewed from several perspectives (Alavi & Leidner, 2001), in this case knowledge management is both a process and a capability. The process perspective concerns the application of expertise (Zack, 1999, 2003). This perspective focuses on knowledge flows and the process of creation, sharing, and distribution of knowledge. Knowledge can also be viewed as a capability. This perspective views knowledge as a potential tool for future action (Alavi & Leidner, 2001). Watson (1999) added to this perspective by suggesting that knowledge is not so much a capability for a specific action, but the capacity to use information for learning and experience. This process results in the ability to interpret information and to ascertain what additional information is necessary in decision-making.

Both the process and capability perspectives of knowledge are seen in organizational collaboration. Collaboration involves an interdependent relationship where the parties work closely together to create mutually beneficial outcomes for all participants (Jap, 1999, 2001). True collaboration between organizations, or between elements of a single organization, can result in benefits including joint knowledge creation, expertise sharing, and understanding of the other party's intentions and strategic approaches (Chapman, Soosay, & Kandampully, 2002; Sinkovics & Roath, 2004).

It is generally believed that increased collaboration both from an intra- and inter-organizational standpoint increases performance and flexibility (Andraski, 1998; Cooper, Ellram et al., 1997; Sinkovics & Roath, 2004). Benefits emerge when partners, either intra- or inter-organizational, are willing to work together to understand each other's viewpoints by sharing information and resources in order to achieve collective goals (Stank et al., 2001). Stank et al. go on to add that the benefits of collaboration are that it

reduces resource duplication, creates greater relevance to customer needs, and increases flexibility in response to changes in customer needs and the environment.

Hypothesis 9: *Employees' perception of intra-organizational collaboration in the contingency planning process will be positively related to their perception of organizational flexibility.*

Hypothesis 10: *Employees' perception of inter-organizational collaboration in the contingency planning process will be positively related to their perception of organizational flexibility.*

Table 3.1

Summary of Proposed Study Hypotheses

Hypotheses
1. Employee's perceptions of top management support for contingency planning will be positively related to their perceptions of organizational flexibility.
2. Employee's perception of organizational goal alignment in the contingency planning process will be positively related to their perception of organizational flexibility.
3. Employee's perception of resource alignment in the contingency planning process will be positively related to their perception of organizational flexibility.
4. Employee's perceptions of information technology usage in the contingency planning process will be positively related to their perceptions of organizational flexibility.
5. Employee's perception of the level of information sharing in the contingency planning process will have a positive impact on their perception of organizational flexibility.
6. Employee's perception of system connectivity in the contingency planning process will be positively related to their perception of organizational flexibility.
7. Employee's perception of the comprehensiveness in the contingency planning process will have a positive impact on their perception of organizational flexibility.
8. Employee's perceptions of standardization of the contingency planning process will be positively related to their perception of organizational flexibility.
9. Employee's perceptions of intra-organizational collaboration in the contingency planning process will be positively related to their perception of organizational flexibility.
10. Employee's perceptions of inter-organizational collaboration in the contingency planning process will be positively related to their perception of organizational flexibility.

Methodology

An understanding of the relationship between constructs such as those of interest in this research effort can be gained by gathering data from actual organizational settings (Bruns & Kaplan, 1987). Therefore, an empirical study utilizing a survey methodology

was used to examine the proposed model and associated hypotheses. The use of surveys is recognized as the most frequently used data collection method in organizational research for assessing phenomena that are not directly observable (Gall, Gall, & Borg, 2003; Schneider et al., 1996; Smith & Dainty, 1991) such as the perception of employees, or the relationship between process attributes on an organizational capability. Bachmann, Elfrink and Vazzana (1999) found that electronic surveys provided the advantages of low-cost, quick response time, and equivalent response rate when compared to traditional mail surveys. Additionally, Griffis, Golsby, and Cooper (2003) found that response rates, response speed, nature of response, and cost per response for online-based surveys were better than traditional mail surveys. Based on the need for quick response and low-cost availability of the medium, a web-based survey was utilized in this research. The methodology was performed in a manner consistent with guidelines suggested by Flynn, Sakakibara, Schroeder, Bates, and Flynn (1990).

In this study, a model was proposed and tested. The model consolidates existing literature on contingency planning and tests the relationship of several planning attributes with organizational flexibility. It posits that organizational flexibility is positively related to specific aspects of top management support, goal and resource alignment, information technology and sharing, connectivity, planning comprehensives and process standardization, and finally, internal and external collaboration. Figure 1 provides a depiction of the hypothesized model.

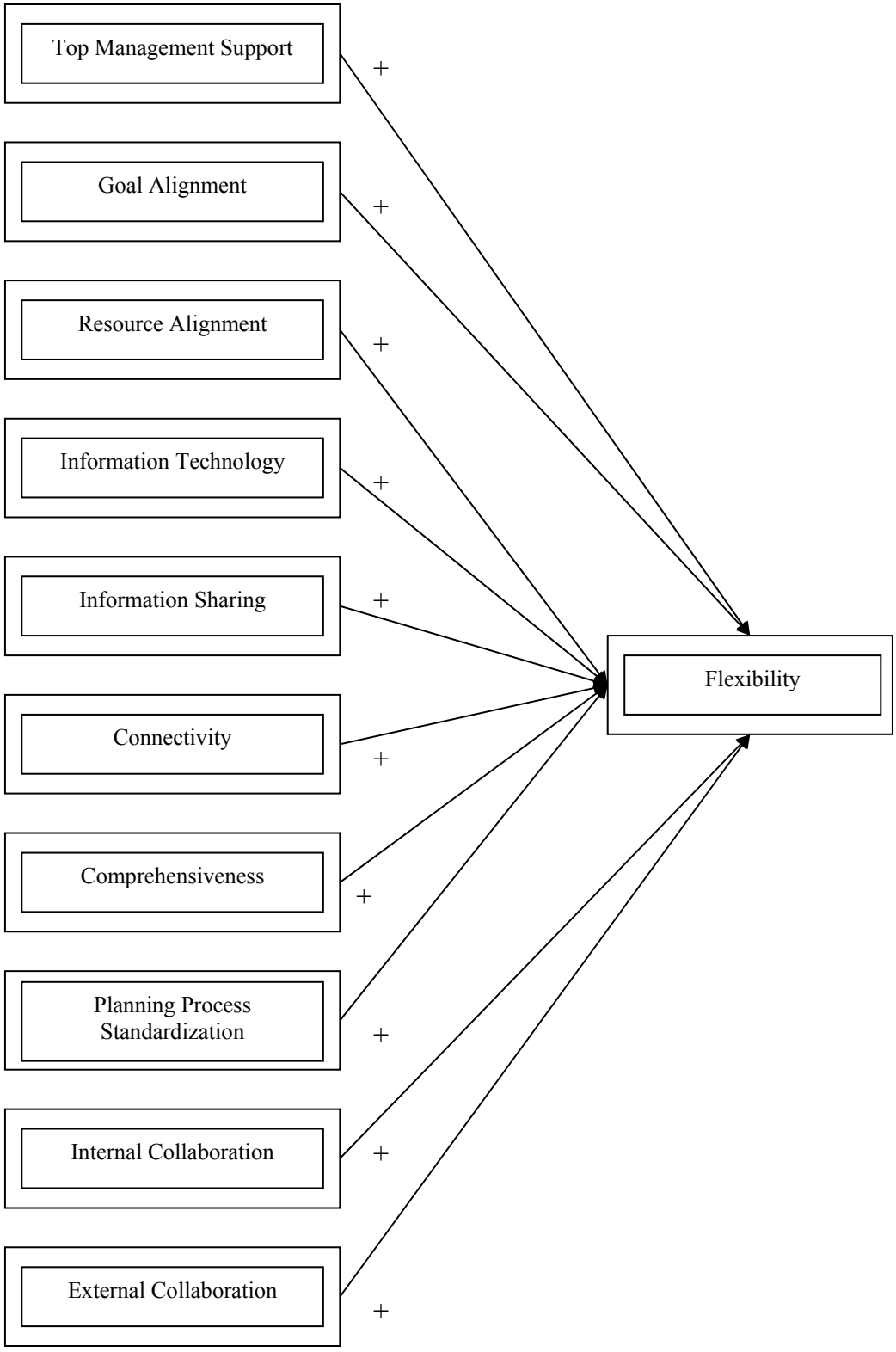

***Figure* 3.1. Planning Flexibility Model**

Participants

Due to the nature of the study and the varying levels and degrees of planning throughout an organization, the population of interest was narrowed to those individuals that have some role in a contingency planning process. The anticipated sample for this effort was approximately 400 personnel involved in the contingency planning process for a governmental organization. These individuals were contacted twice by electronic mail and provided a link to a web-based survey. A total of 168 responses were received resulting in a response rate of 42%.

These respondents were asked to fill out an online questionnaire designed to measure their perception of the relationship between selected contingency planning attributes and organizational flexibility. The participants were primarily upper- and mid-level managers who represent a wide range of functions within the organization and represent multiple facilities within numerous departments. Respondents were reminded to keep their most recent contingency planning experience in mind. Additionally, respondents were asked to keep their references focused on contingency planning and to not include reference to other types of planning, such as financial, career, or operations planning. Data was collected from August through September 2007.

Respondents were also asked to provide additional demographic information about themselves. They were first asked to provide the level of their position within their organization, to include: (a) senior management, (b) middle management, (d) professional, or (e) technician. Next, the respondents were asked how long they had been in their current position, how long with that organization, and how many years planning experience they had. Respondents were also asked to provide their primary

level of involvement in planning, whether plan development or plan implementation. Finally, respondents were asked about the size of their organization. Tables 3.2, 3.3, 3.4, and 3.5 include summary information about the respondents.

Table 3.2

Respondent Position Summary

Respondent Position	Senior	Middle	Professional	Technician
Percentage of Sample	26.79% (45)	44.64% (75)	16.07% (27)	12.5% (21)

Table 3.3

Respondent Experience Summary

	Years in Current Position	Years in Organization	Years Planning Experience
Respondent Average	5.39	11.63	10.71

Table 3.4

*Level of Involvemen*t

	Plan Development	Plan Implementation
Respondent Percentage	53.57% (90)	46.43% (78)

Table 3.5

Respondent Organization Size

	Less than 50	51 to 100	101 to 200	201 to 300	Greater than 300
Respondent Percentage	35.12% (59)	17.86% (30)	20.83% (35)	7.74% (13)	18.45% (31)

A Priori Power Analysis

Based on the literature used to formulate the constructs in this study, there was no generally accepted and agreed upon effect size. For the purposes of determining an a priori power estimation, the researcher used a medium estimated effect size. In order to achieve a minimum desired statistical power level of .80, with a given alpha of .05, estimated effect size of .15, and 10 constructs, the required sample size would be 118 participants (Cohen, 1988). In this case, the 168 usable responses that were collected results in an estimated statistical power level exceeding .995.

Measures

The measurement instrument for this study was a combination of previously used and well-established multi-item scales. The first construct is the dependent variable, organizational flexibility. In order to measure this construct, this study utilized a 3-item scale developed by Fawcett et al. (1996). Based on the work of Hayes et al. (1988), the 1996 Fawcett study describes flexibility as the ready capability to adapt to new, different, or changing requirements. For our purposes, the construct measured employees' perceptions of their organization's ability to handle change within contingency planning, and incorporated a 5-point Likert scale with an original Cronbach's alpha measure of .91 (Fawcett et al., 1996).

The next construct, Top Management Support (TMS), measures employees' perceptions of how the organizations senior management influences their organization's flexibility in contingency planning. This 4-item scale was developed by Bardi, Raghunathan, and Bagchi (1994) as part of their research into the importance of TMS for Management Information Systems. TMS has been identified as an important component

to the success of processes that cross traditional organizational boundaries or compete for existing resources (Min & Mentzer, 2004; Raghunathan & Raghunathan, 1988). The measure incorporates a 5-point Likert scale and resulted in a .90 Cronbach's alpha measure (Bardi et al., 1994).

Goal Alignment, as used here, is a measure of an employee's perception of the influence of aligned vision and goals on the flexibility of an organization's contingency planning process. This study utilized a 3-item, 5-point Likert scale developed by Min and Mentzer (2004), who reported a Cronbach's alpha measure of .84. Based in part on the work of Cannon and Perreault (1999), this measure was developed to measure the level of agreement in the goals between buyers and sellers; similar to the supply chain context of this study.

Similarly, Resource Alignment measures an employee's perception of the influence of shared resources on the flexibility of an organization's contingency planning process. This scale, with two items, was first used by McGinnis and Kohn (1990) with a Cronbach's alpha measure of .72. This scale was developed to measure the importance of coordinated logistics activities and resources on business performance, very similar to the coordinated resources required for contingency planning.

The Information Technology Use construct is a measure of an employee's perception of the influence of information technology on the flexibility of an organization's contingency planning process. This study utilized a 4-item, 5-point Likert scale developed by Stank and Lackey (1997) with a reported Cronbach's alpha measure of .84. Based on previous efforts by the Global Logistics Research Team at Michigan

State University (1995), Stank and Lackey demonstrate the importance of IT use in organizational processes and planning.

From a slightly different perspective, Information Sharing measures the perception of the influence of information sharing between components on the flexibility of an organization's contingency planning process. This 5-item, 5-point Likert scale, also used by Stank and Lackey (1997), had a Cronbach's alpha measure of .73. In their study, this measure was used to show how communication and information sharing better equip an organization to meet changing demands (Rogers, Daugherty, & Stank, 1992; Stank & Crum, 1997).

The next construct utilized, Connectivity, measures employees' perceptions of the influence of connectivity between organizational components on the flexibility of an organization's contingency planning process. Again utilized by Stank and Lackey (1997), this 4-item, 5-point Likert scale was reported to have a Cronbach's alpha measure of .80. Originally used as a partial measure of internal organization and external supply chain integration, this scale was used to help determine the importance of direct communication between components of a process or activity.

The Comprehensiveness construct measures an employee's perception of the influence of the comprehensiveness of the planning process across the entire organization on the flexibility of the planning process. This 7-item scale was developed by Fawcett et al. (1997) and resulted in a Cronbach's alpha measure of .91. In their study, comprehensiveness in the planning processes was found to be an important contributor to an organization's ability to allocate and develop resources in the face of a changing environment (Armstrong, 1982; Fawcett et al., 1997; Herold, 1972).

Planning Process Standardization is designed to measure an employee's perceptions of the affect of a standardized planning process on the flexibility of their organization's contingency planning process. Fawcett et al. (1996) developed a 5-item, 5-point Likert scale and reported a Cronbach's alpha measure of .79. The use of a standardized planning process was found to have a direct impact on an organizations flexibility (Fawcett et al., 1996).

The last two constructs, Internal and External Collaboration, are designed to measure an employee's perception of the influence of collaboration, within and across companies, on the flexibility of an organization's contingency planning process. Stank, Keller, and Daugherty (2001) developed these 5- and 6-item, 5-point Likert scales and reported Cronbach's alpha measures of .81 and .85 respectively. In their study, Stank et al. found that collaborating focuses more resources on business operations which supports more informed decision making, reduced risk, and ultimately increased flexibility (Kahn & Mentzer, 1998; Stank et al., 2001).

Table 3.6 includes a summary of the constructs, the source, the number of items, and reported Cronbach's alpha for each scale. As suggested by Nunnally (1978), an alpha of .70 or higher is indicative of good reliability; all of the constructs selected for this study meet or exceed this requirement. It is important to note that each scale was used in total to avoid the pitfalls of short form development (Smith, McCarthy, & Anderson, 2000). Only minor modifications were made to the items to ensure face validity and common references for respondents. The instrument consisted of 47 items plus demographic information; a copy is provided in Appendix A.

Table 3.6

Constructs Sources

Construct	Source	Items	Cronbach's alpha
Organizational Flexibility	Fawcett, Calantone & Smith, 1996	3	.91
Top Management Support	Bardi, Raghunathan, & Bagchi, 1994	3	.90
Goal Alignment	Min & Mentzer, 2004	3	.84
Resource Alignment	McGinnis & Kohn, 1990	2	.72
Information Technology	Stank & Lackey, 1997	4	.84
Information Sharing	Stank & Lackey, 1997	5	.73
Connectivity	Stank & Lackey, 1997	4	.80
Planning Comprehensiveness	Fawcett, Stanley, & Smith, 1997	7	.91
Planning Process Standardization	Fawcett, Calantone & Smith, 1996	5	.79
Internal Collaboration	Stank, Keller, & Daugherty, 2001	5	.81
External Collaboration	Stank, Keller, & Daugherty, 2001	6	.85

Table 3.7 provides a breakdown of the items in the research instrument, factor analysis, and comparison of the reliability score in the source (original) study and this effort. While conducting the factor analysis for this study, the researcher found that the last two items (items 6 and 7) for the comprehensiveness scale produced a crossload. Separate factor analysis runs were conducted omitting one factor at a time with corresponding scale reliability analysis. The resulting analysis found that the scale

produced a higher reliability when item 6 was removed (α = .87) as opposed to removing item 7 (α = .86). The model R2 of .457 with item 6 was also slightly better than the .450 found with item 7. Based on these findings, item 7 was removed.

Moderating Variable

For later comparison, respondents were asked to provide some basic demographic information such as years of experience, years in current position, and title of current position. Respondents were also asked whether their primary planning involvement is in development or implementation of the plan. This information was requested for potential use as a moderating variable in the analysis of the results. A moderating variable is a variable that alters the direction or strength of the relationship between a predictor and an outcome (Baron & Kenny, 1986; Frazier, Tix, & Barron, 2004). The moderator represents an interaction where the effect of one variable depends on the level of another. The inclusion, or potential inclusion, of a moderating variable can help to explain the relationship between variables (Frazier et al., 2004).

Control Variable

Additional demographic information, specifically the size of the respondent's organization, was requested for potential use as a control variable. Organizational size was included as a linear control variable because of its importance in organizational research (Claycomb & Germain, 1999; Mintzberg, 1979). In this case, it was to control for organizational size as previous studies have shown that size has an impact due to influence over partners and collaboration (Droge & Germain, 1998) and fiscal resources (Gargeya & Thompson, 1994). In this case, organizational size did not demonstrate a significant impact.

Table 3.7

Utilized Constructs

Construct	Items	Factor Analysis	Cronbach's alpha (Original)	Cronbach's alpha (This Study)
Organizational Flexibility	13	.89	.91	.88
	14	.92		
	15	.88		
Top Management Support	31	.91	.90	.91
	32	.96		
	33	.91		
Goal Alignment	34	.91	.84	.91
	35	.94		
	36	.91		
Resource Alignment	37	.92	.72	.82
	38	.92		
Information Technology	16	.89	.84	.92
	17	.89		
	18	.94		
	19	.88		
Information Sharing	39	.72	.73	.87
	40	.88		
	41	.85		
	42	.83		
Connectivity	43	.79	.80	.92
	44	.89		
	45	.91		
	46	.91		
	47	.88		
Planning Comprehensiveness	1	.84	.91	.87
	2	.86		
	3	.84		
	4	.79		
	5	.75		
	6	.53		
Planning Process Standardization	8	.79	.79	.85
	9	.81		
	10	.75		
	11	.79		
	12	.80		
Internal Collaboration	20	.83	.81	.88
	21	.86		
	22	.84		
	23	.85		
External Collaboration	24	.71	.85	.94
	25	.86		
	26	.89		
	27	.90		
	28	.88		
	29	.92		
	30	.84		

Common Method Bias

Inherent in all survey research is the threat of common method bias (CMB). Podsakoff, MacKenzie, Lee, and Podsakoff (2003) provide a summary of sources and methods for dealing with common method problems. According to their work, when the predictor and criterion variables are obtained from the same source, measured in the same context, and the source of the method bias cannot be identified, the researcher should use all procedural remedies in survey design, separate the predictor and criterion variables psychologically, and guarantee response anonymity (Podsakoff et al., 2003). Table 3.8 provides a summary of the most apparent potential sources and the researcher's attempts to control for common method bias in this study.

The following actions were taken in an attempt to control method bias based on the recommendations of Podsakoff et al. (2003). First, when possible, scales with fewer items were selected for inclusion into this survey. Second, scale items were carefully reviewed to ensure clarity for potential respondents. In order to ensure that the reliability of the scale was not impacted, only minor modifications were allowed in this process. Third, any introductory heading references as to the type of construct were removed from the survey. Removing this type of information helps to methodologically separate the dependent and independent variables and to remove potential respondent priming effects.

In an effort to deal with the problem of context induced mood bias, the scale measuring organizational flexibility was moved down the survey. In an effort to combat social desirability and yea saying, an additional construct was included in the survey that will not be used in the final analysis. The additional construct was also an attribute of contingency planning and therefore should not have been confusing to respondents.

Finally, respondents were not asked for any identifying information in an effort to ensure anonymity. This action should have reduced respondents' evaluation apprehension and combated the effect of social desirability.

Table 3.8

Common Method Bias Source and Control

Method Bias Source	Technique for Control
Scale Length	Scales with fewer items utilized to reduce respondent fatigue and carelessness.
Item Complexity / Ambiguity	Items were carefully clarified to ensure understanding by respondents.
Item Priming Effect	Removal of item headings and construct introduction.
Context Induced Mood State	Counterbalancing of questions
Potential Identification of Respondents	Ensure respondent anonymity. No link from survey to respondents.

Results

Model Estimation

Taken together the constructs and associated measures allow us to develop the following model.

$$Y = \beta_0 + \beta_1(TMS) + \beta_2(GA) + \beta_3(RA) + \beta_4(IT) + \beta_5(IS) + \beta_6(CONN) + \beta_7(COMP) + \beta_8(PPS) + \beta_9(IC) + \beta_{10}(EC)$$

Where:

Y	=	dependent variable, Organizational Flexibility
TMS	=	Top Management Support
GA	=	Goal Alignment
RA	=	Resource Alignment
IT	=	Information Technology Use
IS	=	Information Sharing
CONN	=	Connectivity
COMP	=	Comprehensiveness
PPS	=	Process Planning Standardization
IC	=	Internal Collaboration
EC	=	External Collaboration

Results of Hypotheses Tests

The first hypothesis predicted a positive relationship between employee perception of Top Management Support for contingency planning and organizational flexibility. The reported coefficient of .28 is positive and the reported p-value of .00 is significant at alpha level .05. Hypothesis 1 is supported.

The Goal Alignment hypothesis posited a positive relationship between employee perception of the construct and organizational flexibility. The reported coefficient of .09 is positive with a reported p-value of .36 which is not significant at alpha level .05. Hypothesis 2 is not supported.

However, the Resource Alignment hypothesis (#3) posits a positive relationship between employee perception on the alignment of resources and organizational flexibility. The reported coefficient of .28 is positive and the reported p-value of .00 which is significant at alpha level .05. Hypothesis 3 is supported.

The next hypothesis predicted a positive relationship between employee perception of Information Technology Usage and organizational flexibility. With a positive coefficient of .26 and reported p-value of .00, hypothesis 4 is also supported at a .05 statistical significance level.

Hypothesis 5 predicted a positive relationship between Information Sharing and organizational flexibility. While the reported p-value is significant at .00, the results demonstrate a negative coefficient of -.25. Therefore, due to an inverse relationship, hypothesis 5 is not supported.

The Connectivity hypothesis (#6) proposed a positive relationship with organizational flexibility. The results of the analysis did not validate this relationship with a coefficient of .00 and p-value of .96. Hypothesis 6 is not supported.

Hypothesis 7 predicts a positive relationship between the comprehensiveness of the planning process and organizational flexibility. The results of this analysis did not validate this relationship with a reported coefficient of .01 and p-value of .88. Hypothesis 7 is not supported.

Hypothesis 8 predicts a positive relationship between employee perception of the standardization of the contingency planning process and organizational flexibility. This hypothesis is not supported. The analysis results demonstrate a negative coefficient of -.06 and an insignificant p-value of .55. Hypothesis 8 is not supported.

Hypothesis 9 predicted a positive relationship between employee perception of intra-organizational collaboration in the contingency planning process and organizational flexibility. Again, although the p-value of .04 reflects a significant outcome, the results demonstrate a negative coefficient, -.03. Given the inverse relationship, hypothesis 9 is not supported.

The last hypothesis (#10) predicted a positive relationship between employee perception of Inter-organizational collaboration in the contingency planning process and organizational flexibility. The results in this case support the hypothesis with a positive coefficient of .21 and a p-value of .06. Hypothesis 10 is supported at the .10 level of statistical significance. Table 3.9 provides a summary of the complete model results.

Table 3.9

Model Results

Construct	Coefficient	Std Error	P-Value	Supported
Top Management Support	.28	.19	.00[2]	Yes
Goal Alignment	.09	.10	.360	No
Resource Alignment	.28	.09	.00[2]	Yes
Information Technology Usage	.26	.07	.00[2]	Yes
Information Sharing	-.25	.08	.00[2]	No
Connectivity	.00	.08	.96	No
Comprehensiveness	.01	.08	.88	No
Planning Process Standardization	-.06	.10	.55	No
Internal Collaboration	-.19	.09	.04[2]	No
External Collaboration	.21	.11	.06[1]	Yes

1. significant at the .10 level
2. significant at the .05 level

Discussion

Overall, the model as constructed explains roughly half of the variance associated with employee's perception of organizational flexibility in the contingency planning process reporting an R^2 of .45. Six of the constructs measured here were found to be significant: (a) Top Management Support, (b) Resource Alignment, (c) Information Technology Use, (d) Information Sharing, (e) Internal Collaboration, and (f) External Collaboration. Two of the significant findings however, did not support their corresponding hypotheses due to directional inconsistencies.

Information Sharing and Internal collaboration, while significant, reported a negative coefficient, opposite of what was hypothesized. While this study cannot attempt to demonstrate the cause of a negative relationship, two interesting observations can be made. Employees may perceive internal collaboration, beyond some undefined point, as being too restrictive, and thereby reducing organizational flexibility. The effect here would be an organization where every component performs processes in a very similar manner; a disruption would then influence every component in the same way. This lack of ability of a particular section to innovate could be seen as a negative by employees. Also, it could be that employees feel that they are a "slave" to the enabler of information sharing – information technology. In effect, information technology may prevent them from having control, thereby limiting their ability to adjust and be flexible.

Additionally, too much sharing of information between components may be perceived as harmful if the information does not have the same value across component lines. A negative perception might also come from a situation where components lose the ability to generate their own information and are solely reliant on an outside source. If all

components are then dependent on shared information, there may be a perception of inflexibility due to a lack of "internal" control.

As hypothesized, however, Top Management Support was found to have a positive relationship with organization flexibility. As noted by Min and Mentzer (2004), top management support including both leadership and commitment to new processes, is an absolute necessity in the supply chain. Additionally, Resource Alignment was found to have a significant relationship. Goldsby and Stank (2000) reported similar findings and found that closely aligned resources help to achieve both improved service and increased ability to address problems more quickly. Information Technology Use, as expected, was also significant. This reinforces the findings of Stank and Lackey (1997) who found that with advanced information system use, organizations can implement strategy and make decisions more rapidly, thereby increasing their ability to react to a disruption and increase their flexibility. Finally, the External Collaboration hypothesis was supported, albeit at a significance level of .10. Stank, Keller and Daugherty (2001) found that external collaboration is essential in collecting and sharing information and in coordination across operations.

Contribution of this Study

This research effort will contribute on two levels by adding academic rigor to practitioner relevance. While both are important, arguably the most important contribution is to the field of planning practitioners. There are many "how to" examples of what an organization should do to prepare for potential disruptions, but most have little academic rigor and many come without validation and/or an attached consulting fee. This effort will help to allow managers at multiple levels to understand the primary

planning attributes to use to increase organizational flexibility. Additionally, in many situations when both time and fiscal resources are constrained, managers must choose to focus on limited aspects of a project. The results of this effort should enable managers to focus on certain attributes where they can receive the most "bang" for their planning investment. In the world of academia, this effort meets an important need of filling a gap in planning literature. As discussed earlier in this research, much effort has been applied to strategic planning; however, little academic research has been applied specifically to contingency planning, with even fewer studies examining contingency planning in a supply chain context.

Future research opportunities might include additional planning attributes such as technical training or the application of specific knowledge management systems. Additionally, efforts might include a longitudinal study to determine if the import of certain planning attributes change over time. The methods used for data analysis might also be modified to include more powerful statistical techniques.

Limitations

As with any research effort, this study has limitations that could impact the generalizability and validity of the results. In this research effort, the respondents were all representatives of the federal government. While they did represent multiple branches and organizations and were from a wide range of locations, they do ultimately belong to the same higher umbrella organization. A wider range of respondents could make the results more generalizable. The validity of the study also could be affected by common method bias. Common method variance is variance that is attributable to the measurement method rather than the construct the measures represent (Podsakoff et al.,

2003). Method biases are a problem because they are one of the main sources of measurement error and threaten the validity of conclusions about relationships between measures (Nunnally, 1978; Spector, 1987).

With a reported r^2 of .45, this study leaves many opportunities to explain the remaining roughly half of the variance in the dependent variable. While this researcher believes this study makes a step towards a better understanding of the make-up of organizational flexibility and its potential impact on contingency planning, there are additional opportunities to investigate this area further. Additionally, even though power estimates for the model exceed the .995 level at the medium effect size level, individual coefficient effect size might lower. This might result in a situation where significant effects were not detected by the model. Conversely, if individual coefficient effect size is higher, the model might overstate significant findings.

CHAPTER 4: AN APPLICATION OF INNOVATION DIFFUSION TO SUPPLY CHAIN CONTINGENCY PLANNING

Abstract

Recent world events and related research have highlighted the need for effective supply chain disruption solutions. Higher levels of uncertainty in supply and demand, shorter technology and product life cycles, globalization of the market, and the increased use of logistics partners result in a complex supply network. As complexity increases and interdependency becomes prevalent, so does increased risk in the supply chain. Contingency planning has emerged as a method of managing potential disruption. This development has created a need to better understand the incorporation of contingency planning into an organization's processes. Every organization is driven to survive the forces exerted by its environment. Successful organizations utilize innovation as the key element of management initiatives and practices. The use of contingency planning as a management practice to enhance supply chain performance is analogous to the adoption of an innovation. This study of the adoption of planning diffusion is designed to contribute to the growing body of evidence supporting contingency planning in supply chain management.

Introduction

Recent world events and related research have highlighted the need for effective supply chain disruption solutions. Soon after the September 11 attacks, the Toyota Sequoia Plant in Indiana came within hours of halting production due to delays in the delivery of critical steering sensors (Sheffi, 2001). In a separate instance, fire at a supplier facility forced Toyota to shutdown 18 plants for nearly two weeks in February

1997. The estimated costs of the disruption included $195 million in damage and inventory loss with an additional estimated opportunity cost of lost sales of $325 million on 70,000 cars (Converium, 2006).

In another disruption related business event, during the second quarter of 2001 Cisco experienced rapidly weakening demand corresponding with long-term purchasing agreements that continuously increased obsolete inventory combined to result in a $2.5 billion inventory write-off (Spekman & Davis, 2004). In yet another example, a relatively small fire in an Ericsson mobile phone sub-supplier facility resulted in an estimated $400 million loss. Ericsson was not able to meet customer demand of its key consumer products during a critical time and lost months of production capability (Norrman & Jansson, 2004).

As illustrated above, an organization must continuously identify, measure, and evaluate supply chain risk. Complex supply chains are very interdependent, with a single disruption creating a ripple effect that can dramatically impact the entire operation. One preemptive solution to a potential disruption is the establishment of a contingency planning process that enables an organization to be more effective in their prevention of and response to disruption.

The management of a supply chain is an ever-increasing challenge in today's competitive business environment. Higher levels of uncertainty in supply and demand, shorter technology and product life cycles, globalization of the market, and the increased use of distribution, manufacturing, and logistics partners result in a complex international supply network. As the levels of complexity increase and interdependency becomes more prevalent, increased levels of risk occur in the supply chain (Christopher, 2002). Many

studies have used a variety of approaches to investigate techniques used to manage these complex issues. A wide range of topics including risk management (Finch, 2004), operational strategies (Croxton et al., 2001), proactive management (Sinha et al., 2004), and supply chain design (Lowson, 2002), have contributed to the understanding of managing today's complex and interdependent supply chains.

Svensson (2002) describes disruptions as unplanned events that affect the normal, expected flow of materials, information, and components. He goes on to add that the occurrence of disruptions are recognized as an inevitability within a supply chain (Svensson, 2002). A disruption event, stated differently, is the manifestation of risk within the supply chain process. It is not a matter of if a disruption will occur, simply a matter of when and how severe it will be.

The study of risk, interdependence, and the associated impact of disruption is a growing area of interest to many as they strive to reduce their organization's risk of disruption. Recent studies have documented the impacts of disruptions on supply chains in nearly every industry and market segment, including transportation delays and port stoppages (Chapman, Christopher et al., 2002); accidents and natural disasters (Cooke, 2002); poor communication, part shortages, and quality issues (Craighead, Patterson et al., 2006); operational issues (Chopra & Sodhi, 2004); labor disputes (Machalaba & Kim, 2002); and terrorism (Sheffi, 2001). Managerial efforts to combat the effects of disruption are nearly as plentiful, but few are researched beyond their day-to-day application. The emergence of contingency planning as a method of managing potential disruption has created a need to gain a better understanding of the level of incorporation of contingency planning into an organization's processes.

Every organization is driven to survive the forces exerted by its environment. This drive forces employees and organizations to continuously search for new ideas, processes, and strategies to adapt to their ever-changing business environment (Ehigie & McAndrew, 2005). McLoughlin and Harris (1997) add that successful organizations must utilize innovation as the key element of management initiatives and practices. The use of contingency planning as a management practice by an organization to enhance supply chain performance is analogous to the adoption of an innovation.

An innovation has been described as an idea, product, technology, or program that is new to the using entity (Cooper & Zmud, 1990; Rogers, 1995). The process need not be new, as in a new invention, but may be new to the organization, or in fact, a new application of something that is already known (Rogers, 1995). Contingency planning has languished as an emergency response tool, often out of date and of little use when really needed (Facer, 1999). Recent natural disasters and cowardly terrorist actions have brought the need for contingency planning to the forefront for many organizations (Alonso et al., 2001; LeBras, 2004). Based on the "rebirth" in awareness of the importance of contingency planning and the ever-increasing awareness of supply chain vulnerability and the lack of the effective application of contingency planning processes to many supply chain environments, the contingency planning process will be treated as an organizational innovation for the purpose of this study. Therefore, the research conducted in this effort seeks to understand the diffusion of the contingency planning process in organizations where supply chain management is central to the operational effectiveness of the organization.

This study of the adoption of planning and examining its diffusion into and across an organization is designed to contribute to the growing body of evidence on the importance of contingency planning in supply chain management (SCM) (Alexander, 2006; Aragon-Correa & Sharma, 2003; Cerullo & Cerullo, 2004; Chopra & Sodhi, 2004; La Londe, 2005). As a result, the goal of this study is to examine the contingency planning process and the adoption of the contingency planning process by organizations by utilizing a model based on Rogers innovation characteristics (Rogers, 1995). While the number of studies of innovations within the supply chain is growing, there is still a limited amount of progression towards scientific theory building. Flint et. al. (2005) add that the notion and components of innovation need to be explored in greater detail, both breadth and depth.

The researcher identified and measured the relationship between key characteristics of innovation diffusion and attempted to assess their impact on the adoption of contingency planning. This was done by identifying, through a thorough literature review, the key characteristics of the diffusion process and then examining their impacts on the adoption of an innovation, specifically the contingency planning process. The next section of this paper outlines the theoretical foundation for the research effort, including a brief literature review and discussion of supply chain disruptions, risk, and contingency planning, and innovation diffusion. Following that section, a review of the conceptual development of hypotheses will be presented, including a discussion of the application of theory and diffusion characteristics. Finally, the last section includes a review of the methodology, details contributions of the paper, and identifies limitations and opportunities for future research.

Theoretical Foundation

Contingency Theory

Contingency theory states that organizations modify their approach to competition in order to sustain or improve their performance when faced with a change in their environment (Hoffer, 1975). The ability, and willingness, to change with the environment has been documented to be a cornerstone of organizational strategy and performance (Hambrick, 1983; Herbert & Deresky, 1987; Porter, 1980). Contingency theory provides a basic rationale for emphasis on flexibility based strategies for use as a response to environmental threats or opportunities (Bolwijn & Kumpe, 1990; Fawcett et al., 1996). Bracker (1980) argues that firms utilize resources as necessary to achieve specified objectives within a specific competitive environment and under specific conditions.

Strategy and strategic planning processes focus the organizational resources in a manner that enhances firm performance through a competitive driver, such as flexibility (Fawcett et al., 1996). Strategy's importance is seen in two primary areas. First, strategy is seen in the identification of the organization's core objectives and thereby its current and future direction. Second, strategy guides development, organization, and allocation processes used by an organization to achieve their objectives (Fawcett et al., 1996).

Lorange and Vancil (1977) state that strategic planning systems have two major functions: (a) to develop an integrated, coordinated and consistent long-term plan, and (b) to facilitate long-term corporate adaptation to changes in its external environment. The impact of organizational environment on organizational processes has been extensively studied with emphasis on the need for flexibility and protection from

turbulent environmental conditions (Child, 1973a, 1973b; Lawrence & Lorsch, 1967b; Thompson, 1967). Contingency theorists argue that strategic planning linked to performance increases the understanding of the effects of strategic planning on organizational performance under different situations, and will foster a consistent conceptualization of strategic planning characteristics and their relationships to different organizational and environmental characteristics (Egelhoff, 1984, 1985; Wolf & Egelhoff, 2002).

Disruptions

The impacts of environmental disruptions are well documented. Internal supply chain risks research efforts include analysis of product availability and demand fluctuations (Scott, 1981), industry capacity (Lee et al., 2004), changes in technology (Iyer, 1996), and labor market impacts and management turnover (Wiseman & Gomez-Mejia, 1998). Additional studies have identified the impact of long lead times, stock outs, and increased and/or unexpected costs on firm performance (Levy, 1995; Riddalls & Bennett, 2002). The true cost of these disruptions is difficult to quantify, but several research efforts have identified potentially devastating losses.

Less tangible aspects, such as loss of confidence, damaged reputations, and damaged trust also demonstrate the effects of disruption (Garbarino & Johnson, 1999; Spekman & Davis, 2004). In one example, Hendricks and Singhal (2003) reviewed the stock market impacts of supply chain disruptions. The results of their study on 519 supply chain problem announcements revealed a reduction in shareholder value of 10.28%. Hendricks and Singhal (2005) conducted a separate research effort which

studied the impact of 827 announced disruptions on the long run stock price and found an average of -40% return along with dramatic increases in equity risk.

Many companies have increased their dependency on one another in an effort to augment their own internal capabilities. Streamlined efforts result in leaner processes and lead to a reduction in waste and inventory buffers, both of which reduce cost. These actions, no matter how well intended, also have a dark side which can lead to a higher risk of disruption and increase the severity of the disruption (Zsidisin, Ragatz et al., 2005). It is not unexpected to find that there are risks associated with an integrated supply chain. When an organization makes the decision to give up part of its autonomy by working with other firms, its fortunes meld with its partners (Spekman & Davis, 2004). They are now interdependent, meaning they will share successes and risks. Today, one of the many challenges of supply chain management is to plan, control, and monitor the intersections between the organization and its partners. This process creates a boundary that attempts to control the effects of disruption (Sinha et al., 2004).

Risk Management

Interest in risk management research is expanding. Part of this increased interest is the realization by managers that accurate risk assessment and response can improve supply chain effectiveness. This includes the ability to conduct assessments that identify and measure the fiscal impact of risk events, their probability of occurrence, and potential alternative actions. Due to the interconnected aspects of today's supply chain, exposure to risk is greater than ever before making the "uncertainty" lens, the ability to foresee the unexpected, extremely useful for supply chain managers (Barry, 2004).

Interest in risk management research is expanding in both breadth and depth. Recent natural disasters such as Hurricane Katrina and the typhoon in the Indian Ocean have highlighted the need for better disaster preparedness planning (Alff, 2006; Hale & Moberg, 2005). Increased terrorist actions and numerous other potential events on civilian business and transportation centers has led to firms planning for when, not if, a disruption will occur. Aimed at reducing their vulnerability, organizations are developing strategic resilience initiatives to increase their ability to recover from major disruptions (Rice & Caniato, 2003; Sheffi & Rice, 2005). Additional efforts focus on identification and assessment (Chopra & Sodhi, 2004; Zsidisin, 2003; Zsidisin et al., 2004) as well as risk perception (Zsidisin, 2003) of a potential event. Regardless of the approach, all of the efforts are focused on the purpose of classifying the risk and its source to evaluate exposure to the firm.

One interesting aspect of the increased level of risk in today's business environment is the impact of SCM initiatives. Zsidisin, Ragatz, and Melnyk (2005) argue that some SCM initiatives such as lean and JIT actually decrease an organization's ability to withstand disruption, thereby increasing dependency and risk. Emerging concepts, such as continuity planning, help managers selectively rebuild redundancy. These plans help to identify business processes that have the greatest impact on an organization and help to develop the necessary support for those processes (Wisniewski, 1999).

The ability to manage disruption and develop plans in case of a contingency involves early involvement of participants (Zsidisin, Melnyk et al., 2005) and improved visibility and communication (Christopher & Lee, 2004). Risk management within the supply chain has placed many professionals in new territory and forced the application

of new techniques (Elkins et al., 2005; Hauser, 2003; Norrman & Jansson, 2004). Clearly one size does not fit all in the management of potential risk. Attempts to manage supply chain risk have also increased in service industries. With the supply chain costs accounting for as much as 40% of the typical hospital's operating budget, the strategic importance of hospital supply chain management is evident (McKone-Sweet, Hamilton, & Willis, 2005).

As a better understanding of the causes of risk including the identification, assessment, and management of risk has been reached, the realization that there is no single method of controlling it has also been reached. New studies on situational risk management seek to identify potential methods that are appropriate for specific situations (Giunipero & Eltantawy, 2004; Mabert & Venkataramanan, 1998; Niraj, 2001). Along with the development of new techniques comes the application of models from other disciplines.

Contingency Planning

As previously mentioned, one preemptive method of managing the impacts of disruptions is the contingency plan. This special type of planning provides a response blueprint for risks associated with an unknown event (La Londe, 2005). La Londe adds that this planning document should detail a timely and complete response to a specific risk or a cluster of risks.

Clay (1971) states that contingency plans should be made in anticipation of sudden situations which represent either a threat or an opportunity for an organization. He went on to note that a contingency would include a wide range of potential occurrences including currency devaluation, takeover bids, raw material shortages, and

competitor activities (Clay, 1971). Furthermore, Juttner (2005) reported that many organizations expect to see an increase in vulnerability due to growth in supply chain globalization, reduction in inventory holding, centralized distribution, supplier base reductions, outsourcing, and centralized production. Today's lean supply chains are becoming increasingly fragile and less able to deal with shocks and disruptions that can have a dramatic impact on an organization (Zsidisin, Ragatz et al., 2005). This increase in risk, whether generated externally or internally, forces organizations to develop formalized plans to deal with potential disruptions. According to the Merriam-Webster Dictionary, a contingency is "an event, or emergency that may, but is not certain to occur," or "something liable to happen as an adjunct to or result of something else." These definitions include situations where crisis management, disaster planning, business interruption, or business continuity planning might be used. This research effort uses the term "contingency" to represent all of the aforementioned situations incorporating business interruption, continuity, crisis, disaster, or emergency situation.

The aim of the contingency plan is to minimize potential loss by identifying, prioritizing, and safeguarding assets that need protection with the goal of the organization being to save valuable resources in the event of a disruption or disaster. Borrowing from the work of Rice and Caniato (2003), contingency planning means developing a plan to be resilient, or prepared to respond to and restore operations after an unexpected disruption occurs. Barnes (2001) adds that this form of planning is the integration of formalized procedures and resource information that organizations can use to recover from a disaster that causes a disruption to business operations.

Contingency planning has been identified as a crucial issue for many organizations. In the 2003 and 2005 Bain Management Tool Surveys, 70% and 54%, respectively, of companies surveyed cited widespread use of contingency planning with their organizations (Rigby, 2003; Rigby & Bilodeau, 2005). Additionally, the Deloitte and Touche/CPM 2005 Business Continuity Survey found that investments in contingency planning has increased by 53% in 6 years from 30% in 1999 to 83% in 2005 (Deloitte & Touche, 2005). Research involving contingency planning has become widespread across multiple disciplines (Barnes, 2001) including banking (Johnson, 2006), engineering (Bent, 2001), finance (Ferris, 2002; Miller, 2003), insurance (Bandyopadhyay, 2002; Kleffner et al., 2003; Shugrue & Dreher, 2006), health care (Iyer & Bandyopadhyay, 2000), manufacturing (Guide Jr, Jayaraman, & Linton, 2003; Iyer & Sarkis, 1998), supply chain management (Svensson, 2002, 2004), and logistics (Hale & Moberg, 2005).

The types of contingencies identified have grown to include more non-traditional disruption causes like natural disasters, terrorist actions, and information technology issues (Alexander, 2006; Anonymous, 1994; Bent, 2001; Fawcett & Cooper, 1998). The global marketplace, with all of its inherent risk and increased potential for disruption has driven supply chain organizations to look for new ways to innovate (Flint et al., 2005).

Innovation Diffusion

Innovation diffusion as a field of study spans several academic areas over more than 100 years and has been utilized in more than 3,800 studies (Cegielski, Reithel, & Rebman, 2008). Considerable research based on classical diffusion of integration theory has contributed concepts and a large body of empirical research relevant to information

technology (Cooper & Zmud, 1990; Moore & Benbasat, 1991), agriculture (Ryan & Gross, 1943), medicine (Coleman, Katz, & Menzel, 1966), and the supply chain (Flint et al., 2005). Katz (1961) concludes that innovation diffusion is a process by which communication regarding an innovation occurs through certain channels over time among the members of a society. Cegielski et al. point out that this definition contains four important elements that are used in all previous innovation diffusion studies: (a) an innovation, (b) channels of communication, (c) time, and (d) the social system. An innovation is an idea, practice, or an object perceived as new by an individual, organization, or other unit of adoption (Rogers, 1995). Flint et al. (2005) further clarify that an innovation does not need to be new to the world, merely new to the potential adopter.

The diffusion perspective views innovation adoption as a social and communications problem rather than one of technology or economics (Russell & Hoag, 2004). The theory explains and predicts the influence of a wide range of factors on the innovation adoption and implementation decisions (Rogers, 1995). Adoption is a common dependent variable in many diffusion studies (Russell & Hoag, 2004). Adoption is a decision to make full use of an innovation as the best course of action available to an organization (Rogers, 1995). This decision results in action to invest the necessary resources to implement the innovation (Cooper & Zmud, 1990). In relation to organizational management, innovation is the process of being creative and implementing new methods to organize or run a company and create improved results (Ehigie & McAndrew, 2005; Gates & Ray, 1998).

Rogers (1995) developed a model of five general attributes of innovations that regularly influence adoption. Table 4.1 includes a brief statement of what the innovation characteristics measure as well as two additional constructs discussed later in this document. Tornatzky and Klein (1982) and Moore and Bensabat (1991) sought to add constructs to Rogers' foundational work. These additions have been particularly useful in information technology research (Harrison, Mykytyn, & Riemenschneider, 1997). Particularly, the augmentation work of Moore and Bensabat led to a comprehensive measurement instrument designed to examine the decision to adopt an innovation. With this foundation in theory, planning, and innovation, the next section will examine the basic innovation characteristics on the adoption of organizational contingency planning.

Table 4.1

Innovation Characteristics

Characteristic	Focus
Relative Advantage:	How much better an innovation is perceived to be compared to its predecessor
Compatibility:	How consistent an innovation is perceived to be with regard to existing values, experiences, and the needs of the targeted adopters
Complexity:	How difficult an innovation is perceived to be to learn and use
Observability:	How visible the results of an innovation are to others
Trialability:	How much an innovation may be experimented with prior to adoption

Centralization:	How much decision making, in the form of power and control, is held by a few people in an organization.
Top Management Support:	How the senior leadership of an organization contributes to the successful adoption and diffusion of an innovation.

Conceptual Development

Global markets, intertwined supply chains, and mutual dependence have all highlighted the need for contingency planning. However, the importance of planning is not a new concept. The Chinese philosopher Sun Tzu captured the essence of planning in stating those who are not aware of disadvantageous strategies, cannot be aware of strategies that are advantageous (Sunzi & Clavell, 1981). Generally, contingency planning is a process in which an organization develops and maintains an effective plan of how the organization will prepare for and operate when business activities are interrupted (Andrews, 1990).

Rogers' (1995) proposed characteristics of innovation provide the foundation for the development of the model used in this study. While Rogers based his study on the adoption of innovation by individuals, the same characteristics can be used in the study of innovation adoption by an organization (Eveland & Tornatzky, 1990; Fichman & Kemerer, 1993; Flint et al., 2005). The following discussion outlines the hypothesized relationship between the five characteristics defined by Rogers plus two additional constructs: (a) top management support and (b) centralization. Figure 4.1 models the relationship between these characteristics and diffusion of the contingency planning process.

Relative Advantage

The relative advantage of an innovation is the degree to which the innovation is perceived as superior to existing substitutes (Rogers, 1995). Recognition of the perceived superiority is the perceived benefit the innovation can provide to an organization (Brown, Booth, & Giacobbe, 2004; Iacovou, Benbasat, & Dexter, 1995). The relative advantage of a contingency planning process is illustrated by how an established planning process can help an organization avoid major losses following disasters or disruptions (Ansoff et al., 1970; Barnes, 2001; Brassell-Cicchini, 2003). Without a contingency plan, disruptions can inflict tremendous losses on organizations participating in the supply chain. Organizations that are aware of and plan for disruption risk in the supply chain will perceive the adoption of a contingency planning process to be a potential strategic advantage.

Hypothesis 1: *The adoption of a contingency planning process is positively related to the perceived relative advantage of contingency planning.*

Compatibility

The compatibility of an innovation refers to the degree to which an innovation is perceived to be consistent with existing values, past experiences, and needs of potential adopters (Rogers, 1995). Higher compatibility increases the likelihood of acceptance of an innovation (Cegielski, 2001). In the past, many supply chains have depended on back-up systems, experienced personnel, and additional resources such as increased levels of inventory to restore operations following a disruption (Stonebraker & Afifi, 2004; Zsidisin et al., 2004; Zsidisin, Ragatz et al., 2005). In today's global setting, supply chain integration and collaboration along with high-level usage of information technology

mean that the effect of a disruption will no longer be restricted to a single organization but will be carried to all members within the chain (Craighead, Blackhurst et al., 2006; Lee et al., 2004).

To develop contingency planning processes that involve consideration of other members of the supply chain, individual organizations must change internal processes intended for stand-alone use. As many organizations tend to resist change, these new processes may be perceived to be incompatible with current planning operations. The more an innovation is perceived as consistent with present systems, procedures, and value systems of the potential adopter, the more likely it is that it will be adopted (Premkumar, Ramamurthy, & Nilakanta, 1994; Rogers, 1995).

Hypothesis 2: *The adoption of a contingency planning process is positively related to the perceived compatibility of contingency planning.*

Complexity and Ease of Use

The complexity of an innovation is the degree to which an innovation is perceived as being relatively difficult to understand and use (Rogers, 1995). While an innovation may appear to be usable and useful to an organization, the organization, or individuals within it, might not have the necessary expertise to use the innovation. Rogers' scale for complexity has received some criticism. Factor analysis of the results from several studies have not supported the classification of the complexity construct (Hurt & Hubbard, 1983). As such, Davis (1986) developed a new construct as part of the larger Technology Acceptance Model (TAM).

The TAM is quite similar to Rogers' Innovation Diffusion model, substituting the construct 'ease of use' for complexity. Davis defined this construct as the degree to

which an individual that is using a particular system would enhance his or her job performance (Davis, 1986). Since TAM is quite similar to Rogers' model and the constructs are quite similar in meaning, ease of use can be utilized as a substitute for complexity (Moore & Benbasat, 1991). The perceived ease of use of an innovation can be expected to influence the adoption of the innovation (Premkumar et al., 1994).

Hypothesis 3: *The adoption of a contingency planning process is positively related to the perceived ease of use of contingency planning.*

Trialability

The trialability of an innovation is the degree of experimentation with an innovation that is possible (Rogers, 1995). The greater the opportunity to manipulate and test an innovation, the greater the ease of adaptation and utilization (Ryan & Gross, 1943). In most cases, a contingency planning process cannot be perfected immediately (Connell, 2004; Morwood, 1998; Nohria, 2006). Several studies suggest a phased approach for implementing contingency planning, including measuring the impact of actions taken and periodically reevaluating the process itself (La Londe, 2005; Pearson & Mitroff, 1993). Testing aspects of the process allows an organization to determine what and how the process will work, thereby increasing the likelihood of innovation adoption.

Hypothesis 4: *The adoption of a contingency planning process is positively related to the trialability of contingency planning.*

Observability

The observability of an innovation refers to the degree to which the results of an innovation are visible to others (Rogers, 1995). Innovations with benefits that are clearly visible are likely to be accepted more rapidly (Rogers, 1995). Organizations that observe

other organizations recover from supply chain disruptions through the use of contingency planning are likely to be interested in adopting a contingency planning process (Rigby, 2003; Rigby & Bilodeau, 2005). As previously discussed, interest in contingency planning has grown dramatically as can be seen in the 53% increase in contingency planning process investment from 1999 to 2005 (Deloitte & Touche, 2005). In the context of the supply chain, close collaboration and increased integration allow for increased visibility into other organization's operations. This increase in visibility allows an organization to more readily observe the impacts of an innovation.

Hypothesis 5: *The adoption of a contingency planning process is positively related to the observability of contingency planning.*

Centralization

The term centralization is used here to symbolize the degree of decision making concentration. This means the degree to which the power and control in an organization are held by a relatively few individuals. Centralization has been found to be negatively associated with innovativeness (Hage & Aiken, 1969; Moch & Morse, 1977; Rogers, 1995; Russell & Hoag, 2004). The range of new ideas or processes is effectively limited in situations where only a few key individuals control the acceptance or application of new technologies, processes, or innovations (Moch & Morse, 1977). Grover (1993) adds that decreased autonomy of organizational components and the bounded perspective of centralized decision making are often the reasons for this negative association.

Hypothesis 6: *The adoption of a contingency planning process is negatively related to the decision-making centralization of an organization.*

Top Management Support

The importance of top management support on any proposed innovation, action, or process is not surprising. In fact, the importance of top management support has been identified in studies concerning resource allocation (Akkermans et al., 1999; Cerullo & Cerullo, 2004) and successful management initiatives (Fawcett et al., 2006; Marien, 2000). Without planning, support, patience, and leadership from management, many programs can become large drains of time, effort, and resources for an organization (Quinn, 1985; Wisner & Lewis, 1997). Bardi et al. (1994) adds that without top management support, many systems will not develop beyond minimum requirements stage, failing to reach their intended goals of improved competitive advantage.

Hypothesis 7: *The adoption of a contingency planning process is positively related to top management support of the planning innovation.*

Methodology

An understanding of the relationship between constructs such as those of interest in this research effort can be gained by gathering data from organizational settings (Bruns & Kaplan, 1987). Therefore, an empirical study utilizing a survey methodology was used to examine the proposed model and associated hypotheses. The use of surveys is recognized as the most frequently used data collection method in organizational research for assessing phenomena that are not directly observable (Gall et al., 2003; Schneider et al., 1996; Smith & Dainty, 1991) such as the perception of employees, or the relationship between process attributes on an organizational capability. The methodology was performed in a manner consistent with the guidelines suggested by Flynn et al. (1990).

The model posits that contingency planning process adoption is positively influenced by seven innovational characteristics include: (a) relative advantage, (b) compatibility, (c) ease of use, (d) trialability, (e) observability, (f) centralization, and (g) top management support. Once data was collected, a logistic regression technique was used to determine the direction, positive or negative, and strength of the relationship.

Measures

The measurement instrument for this study is a combination of previously used and well-established scales. Table 4.2 summarizes the constructs, source, the number of items, and reported Cronbach's Alpha for each scale. As suggested by established literature references, an alpha of .70 or higher is indicative of good reliability (Nunnally, 1978); all of the constructs selected for this study meet this requirement.

Table 4.2

Constructs of Interest

Construct of Interest	Source	# of Items	Cronbach's Alpha (Original)
Relative Advantage	Moore and Benbasat, 1991	5	.90
Compatibility	Moore and Benbasat, 1991	3	.86
Ease of Use	Moore and Benbasat, 1991	4	.84
Observability	Moore and Benbasat, 1991	2	.83
Trialability	Moore and Benbasat, 1991	2	.71
Centralization	Grover, 1993	4	.73
Top Management Support	Grover, 1993	3	.95

It should be noted that each scale was used in total to avoid the pitfalls of short form development (Smith et al., 2000). Only minor modifications were made to the items to ensure face validity and common references for respondents. The instrument consists of 23 items plus demographic information. The instrument is included as Appendix B.

Participants

The population of interest in this study is 750 members of a large service organization. The participants, primarily upper and mid-level managers, represent a wide range of functions within the organization at multiple facilities within numerous departments. Due to the nature of the study and the varying levels and degrees of planning throughout the organization, the population of interest was narrowed to those individuals that have some role in contingency planning and will not include other specific planning areas such as financial or operational planning. For later comparison, respondents were asked to provide some basic demographic information such as years of experience, years in current position, and title of current position.

As illustrated by Tables 4.3 and 4.4, a total of 152 participants responded to the survey for a response rate of 20.25% (152/750). Respondents consisted of primarily upper and mid-level managers who represented a wide range of functions within various organizations at multiple facilities within numerous departments. Due to the nature of the study and the varying levels and degrees of planning throughout the various organizations and functional units, the population of interest was narrowed through a pre-testing and pre-qualification process to those individuals that had some direct role in supply chain contingency planning processes.

Table 4.3

Adopters by Organizational Size

Business Activity (# of Employees)	Non-Adopters	Adopters	Total	Percent Adopted
Large (Over 300)	19	58	77	75.3%
Medium (100 to 300)	6	19	25	76.0%
Small (Less than 100)	15	35	50	70.0%

Total	40	112	152	73.7%

Table 4.4

Adopters by Business Activity

Business Activity	Non-Adopters	Adopters	Total	Percent Adopted
Defense Industry	10	62	72	63.3%
Manufacturing	9	13	22	59.1%
Service Provider	21	37	58	63.8%
Total	40	112	152	73.7%

A Priori Power Analysis

Based on the literature used to formulate the constructs in this study, there was no generally accepted and agreed upon effect size. For the purposes of determining an a priori power estimation, the researcher used a medium estimated effect size. In order to achieve a minimum desired statistical power level of .80, with a given alpha of .05, estimated effect size of .15, and seven constructs, the required sample size would be 103 participants (Cohen, 1988). In this case, 152 usable responses were collected which results in an estimated statistical power level exceeding .995.

Moderating Variable

For later comparison, respondents were asked to provide some basic demographic information such as years of experience, years in current position, and title of current position. They were also asked whether their involvement in the planning process is most closely related to the development of the process or its implementation. This information is requested for potential use as a moderating variable in the analysis of the results. A moderating variable is a variable that alters direction or strength of the relation between a

predictor and an outcome (Baron & Kenny, 1986; Frazier et al., 2004). The moderator represents an interaction where the effect of one variable depends on the level of another. The inclusion of a moderating variable can help to explain the relationship, or lack thereof, between variables (Frazier et al., 2004).

Control Variable

Additional demographic information, specifically the size of the respondent's organization, was requested for potential use as a control variable. The author included organizational size as a linear control variable because of its importance in organizational research (Claycomb & Germain, 1999; Mintzberg, 1979). In this case, it may be necessary to control for organizational size as previous studies have shown that size has an impact on results due to influence over partners and collaboration (Droge & Germain, 1998) and fiscal resources (Gargeya & Thompson, 1994). Once data have been collected multiple regression techniques were used to determine whether the impact of the relationship was positive or negative, and the strength of the relationship.

Common Method Bias

Due to the nature of the data collection for this research, the survey was conducted utilizing an online survey, and time and schedule will not permit the use of temporal separation of measurement. Fundamentally, this greatly increases the probability of higher levels of common method bias in this study. Podsakoff et al. (2003) provide a summary of sources and methods for dealing with common method problems. According to their work, when the predictor and criterion variables are obtained from the same source, measured in the same context, and the source of the method bias cannot be identified, the researcher should use all procedural remedies in survey design, separate

the predictor and criterion variables psychologically and guarantee response anonymity (Podsakoff et al., 2003). Table 4.5 provides a summary of the most apparent sources and the attempts to control common method bias in this study. This following description of actions taken to deal with method bias is based on the recommendations provided by Podsakoff et al. First, when possible, scales with fewer items were selected for inclusion into this survey. Second, scale items were carefully reviewed to ensure clarity for potential respondents. In order to ensure that the reliability of the scale was not impacted, only minor modifications were allowed in this process. Third, any introductory heading references as to the type of construct were removed from the survey. Removing this type of information helps to methodologically separate the dependent and independent variables and to remove potential respondent priming effects. In many cases, the scale used to measure the dependent variable is listed first in the survey. In an effort to deal with the problem of context induced mood bias, the scale measuring the dependent variable organizational flexibility was moved down the survey thereby shielding the underlying purpose of the research instrument. Finally, respondents were not asked for any identifying information in an effort to ensure anonymity. This action should have reduced respondents' evaluation apprehension, combating the effect of social desirability.

Table 4.5

Common Method Source and Control

Method Bias Source	Technique for Control
Scale Length	Scales with fewer items utilized to reduce respondent fatigue and carelessness.
Item Complexity / Ambiguity	Items were carefully clarified to ensure understanding by respondents.

Item Priming Effect	Removal of item headings and construct introduction.
Context Induced Mood State	Counterbalancing of questions
Potential Identification of Respondents	Ensure respondent anonymity. No link from survey to respondents.

Statistical Method

For modeling purposes, the survey respondents reported use / non-use of a contingency planning process which was used as a dichotomous dependent variable. The seven dimensions of interest, developed in the hypotheses, are the independent variables. Due to the dichotomous nature of the dependent variable, a logistic regression technique was used to analyze the collected data. Logistic regression is a special form of regression in which the dependent variable is a non-metric, dichotomous variable (Hair et al., 2005, p. 272). Hair et al. go on to add that logistic regression is less affected by variance - covariance inequalities, handles categorical independent variables, and has simpler interpretation in comparison to other discriminant and multiple regression techniques.

Analysis

As discusses previously, contingency planning was classified as either utilized or not utilized. Since the dependent variable is dichotomous the researcher used a binomial logistic model to test the relationship between contingency planning process adoption and the hypothesized diffusion characteristics: (a) relative advantage, (b) compatibility, (c) ease of use, (d) trialability, (e) observability, (f) centralization, and (g) top management support. The formal model is

$$\left(Y_i\right) = \frac{1}{1+e^{-z}} \qquad (1)$$

where I is the individual respondent identifier. The dependent variable, Y_i, is set equal to 1 if the respondent reported that their organization utilized a contingency planning process. Y_i is set equal to 0 if the respondent reported that their organization did not utilize a contingency planning process. For estimation purposes, the logistic regression model is represented by the following equation, where the vector of independent variables is

$$z = \beta_1(RA) + \beta_2(C) + \beta_3(EU) + \beta_4(T) + \beta_5(O) + \beta_6(CE) + \beta_7(TMS)) \qquad (2)$$

where RA is relative advantage, C is compatibility, EU is ease of use, T is trialability, O is observability, CE is centralization, and TMS is top management support. Each of the independent variables are multi-item scales computed by averaging the individual item scores associated with each construct per respondent. Table 4.6 reports the factor analysis results of the items used in this study as well as a comparison of the scales' original Cronbach's Alpha as well as the Cronbach's Alpha for this study.

Table 4.6

Factor Analysis and Cronbach's Alpha Comparison

Construct of Interest	Source	Items	Factor Analysis	Cronbach's Alpha (Original)	Cronbach's Alpha (This Study)
Relative Advantage	Moore and Benbasat, 1991	1	.77	.90	.90
		2	.85		
		3	.79		
		4	.83		
		5	.76		
Compatibility	Moore and Benbasat, 1991	6	.66	.86	.86
		7	.85		
		8	.98		

Ease of Use	Moore and Benbasat, 1991	9 10 11 12	.56 .57 .94 .68	.84	.78
Observability	Moore and Benbasat, 1991	13 14	.72 .72	.83	.68
Trialability	Moore and Benbasat, 1991	15 16	.87 .87	.71	.86
Centralization	Grover, 1993	17 18 19 20	.78 .65 .57 .73	.73	.62
Top Management Support	Grover, 1993	21 22 23	.86 .92 .64	.95	.84

The model was estimated with data from 152 respondents with planning responsibilities. The goal was to determine if the diffusion characteristics differed in the use or non-use of contingency planning processes. Using the logistic regression module of SPSS version 15, the researcher calculated the following estimated model to fit the 152 data points:

$$(Y_i) = 2.06 + .92(RA) + -.06(C) + -.11(EU) + .93(O) + -.61(T) + -1.76(CE) + .48(TMS) + e_i \quad (3)$$

Since no one method of analyzing model fit is ideal for every application, the overall fit of the model was evaluated using two separate methods. The researcher evaluated the change in the negative 2 log likelihood (-2LL) versus the null model (constant only) value. Since a perfect model would have a -2LL value of zero, the lower the value the better overall fit of the model. The -2LL value for the above equation was 119.36, compared to the null model value of 175.21. The reduction in the -2LL value indicates the estimated model was a considerable improvement over the null model with an R^2_{LOGIT} of .32 (Hair et al., 2005, p. 362). Classification, or hit, rates are also used to evaluate the fit of binomial logistic regression models (Hair et al., 2005). Overall, the

model correctly classified 82.9% of the cases. The model correctly predicted that contingency planning processes were not used in 21 of 40 cases, or 52.5% of the time. The model also correctly predicted when contingency planning processes were used in 105 out of 112 cases, or 93.8% of the time.

In cases of unequal sample sizes like this one, the proportional chance criterion is used to determine the odds of classifying subjects correctly by chance (Hanna & Maltz, 1998; Morrison, 1969). Given the near 3 to 1 split in our sample, the proportional chance criterion can be computed as

$$C_{pro} = \left(p^2\right) + \left(1 - p\right)^2 = .74^2 + \left(1 - .74\right)^2 = 61.22\% \qquad (4)$$

Where p represents group 1, contingency planning process users, and 1-p represents group 2, respondents who reported that their organization did not utilize a contingency planning process.

The classification results for this effort are much better than chance (82.9% compared to 61.22%). The model appears to have been good fit based on both the reduction in log-likelihood and the percentage of cases classified correctly. Given these results, the researcher then examined the parameters associated with the independent variables to compare the research hypotheses with the model results. In this case, formal hypothesis testing proceeded in two steps. First, the sign of each estimated parameter was considered. Here, three of seven independent variables (Compatibility, Ease of Use, and Trialability) had negative coefficients, opposite of the hypothesized relationship. Next, the researcher tested the hypothesis that the parameter was zero could be rejected based on the Wald test. The Wald test is the binomial logistic regression analog to the t-test in

ordinary or multiple regression (Hair et al., 2005, p. 363). Table 4.7 provides the parameter estimates, Wald statistics, and associated p-values.

Table 4.7

Summary Results of the Binomial Logistic Regression

Variable	Estimate	Std Error	Wald	p
H1: Relative Advantage	.92	.36	6.39	.01
H2: Compatibility	-.06	.40	.02	.88
H3: Ease of Use	-.11	.36	.10	.75
H4: Observability	.93	.35	7.00	.01
H5: Trialability	-.61	.17	12.16	.00
H6: Centralization	-1.76	.51	11.87	.00
H7: Top Management Support	.48	.23	4.21	.04
Constant	-6.75	2.85	5.63	.02

Results of Hypothesis Tests

Table 4.8 provides a summary of the hypothesis results. The first hypothesis predicted a positive association with higher levels of perceived relative advantage and the use of a contingency planning process. The parameter estimate of .92 is positive. The hypothesis that the "true" value of the relative advantage group is zero was tested using the Wald statistic. The associated p-value of .01 is less than the usual threshold of .05 for statistical significance. Therefore, Hypothesis 1 is supported.

The second hypothesis predicted a positive relationship between perceived compatibility and the reported use of a contingency planning process. The associated parameter of -.06 has the wrong sign; opposite of the hypothesized relationship. Additionally, the Wald test and associated p-value of .88 cause this hypothesis to be rejected. Hypothesis 2 is not supported.

The third hypothesis predicted a positive relationship between perceived ease of use and the reported use of a contingency planning process. The associated parameter, -.11, again has the wrong sign and is opposite of the hypothesized relationship. The Wald test and associated p-value, .75, confirm that Hypothesis 3 is not supported.

The fourth hypothesis predicted a positive relationship between perceived observability and the reported use of a contingency planning process. Here the associated parameter of .93 is positive. The p-value (.01) associated with the Wald test confirms that Hypothesis 4 is supported.

Hypothesis 5 predicted a positive relationship between perceived trialability and the reported use of a contingency planning process. While the p-value (.00) associated with the Wald test is below .05, the associated parameter has the wrong sign (-.61). Hence, Hypothesis 5 is not supported.

Hypothesis 6 predicted a negative relationship between the decision-making centralization of an organization and the reported use of a contingency planning process. In this case, the associated parameter of -1.76 reflects the hypothesized negative relationship and the p-value (.00) associated with the Wald test is below .05. Therefore, Hypothesis 6 is supported.

Finally, Hypothesis 7 predicted a positive relationship between perceived top management support and the reported use of a contingency planning process. The associated parameter (.48) is positive and the p-value (.04) associated with the Wald test is below the .05 cutoff. Hypothesis 7 is therefore supported.

Table 4.8

Summary of Summary of Hypotheses Results

Hypothesis	p	Supported
H1: Relative Advantage	.01	Y
H2: Compatibility	.88	N
H3: Ease of Use	.75	N
H4: Observability	.01	Y
H5: Trialability	.00	N
H6: Centralization	.00	Y
H7: Top Management Support	.04	Y

Conclusion

Contingency planning has been studied as part of the larger strategic management discussion and to demonstrate the importance of its use as a risk management technique. However, knowing that contingency planning is important is only part of the story. What characteristics make a planning process more likely to be adopted by the organization is extremely important to the ultimate success of the plan. Simply put, if individuals within the organization do not support the process they are not likely to perform it, or at least, perform it well. On the other hand, the identification of which characteristics may make a supply chain contingency planning process more attractive or likely to be adopted by an organization or its supply chain network is highly beneficial to managers. If management and individuals within an organization understand the variables to review prior to considering adoption of a supply chain contingency planning process, opportunities for success are enhanced.

Contribution of this Study

This research effort contributes in two areas: practice and research. First, the research contributes to the practitioner base by adding academic rigor to practitioner relevance. While both are important, arguably the most important contribution is to the field of planning practitioners. There are many "how to" examples of what an organization should do to prepare for potential disruptions, but most have little academic rigor and many come with an attached consulting fee. This effort will allow managers at multiple levels to understand the primary innovational characteristics of contingency planning and to understand the relationship of those characteristics to the adoption of the innovation. Understanding these relationships should increase the probability of adoption of the innovation. Additionally, in many situations when both time and fiscal resources are constrained, managers must choose to focus on limited aspects of a project. The results of this effort should enable managers to focus on certain characteristics where they can receive the most "bang" for their innovation "buck."

In the world of research, this effort meets an important need by filling a gap in planning literature. As discussed earlier in this research, much effort has been applied to the study of disruption, contingency planning, and innovation diffusion. However, little academic research has been applied specifically to the adoption of contingency planning processes.

Limitations and Future Research

As with any research effort, this study has limitations that could impact the generalizability and validity of the results. In this research effort, the respondents were all representatives of the federal government. While they did represent multiple branches and organizations and were from a wide range of locations, they do ultimately belong to

the same higher organization. A wider range of respondents could make the results more generalizable. The validity of the study could be affected by common method bias. Common method variance is variance that is attributable to the measurement method rather the construct the measures represent (Podsakoff et al., 2003). Method biases are a problem because they are one of the main sources of measurement error and they threaten the validity of conclusions about relationships between measures (Nunnally, 1978; Spector, 1987).

Future research opportunities might include the addition of other innovation characteristics. Additionally, efforts might include a longitudinal study to determine if the relationship of the characteristics changes over time or with different types of innovations. The methods used for data analysis might also be modified to include more powerful statistical techniques. The opportunity to add additional adoption characteristics might also prove helpful in predicting adoption of contingency planning process. Additionally, even though power estimates for the model exceed the .995 level at the medium effect size level, individual coefficient effect size might lower. This might result in a situation where significant effects were not detected by the model. Conversely, if individual coefficient effect size is higher, the model might overstate significant findings.

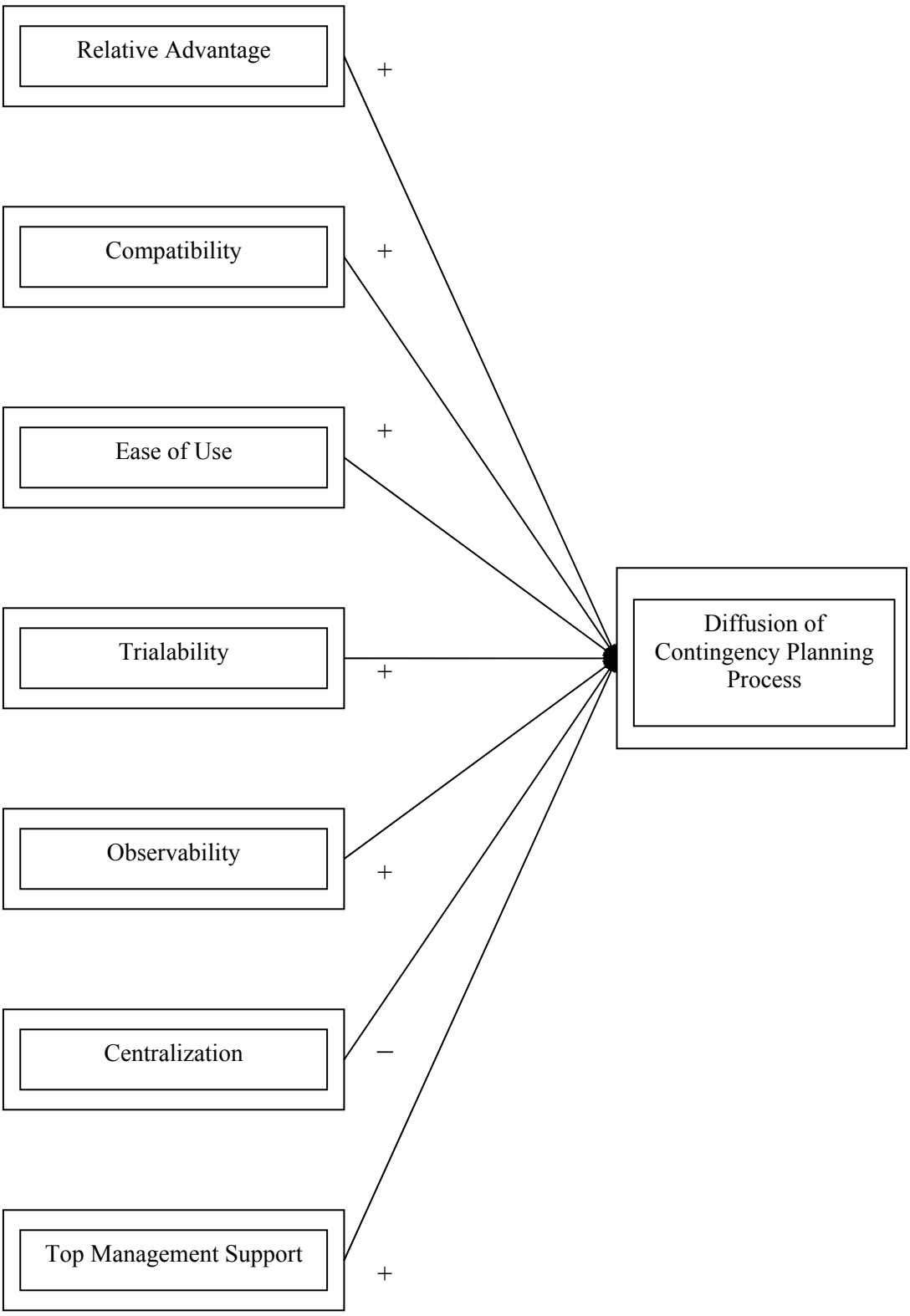

Figure 4.1. Innovation Characteristics Model

CHAPTER 5: SUMMARY AND CONCLUSIONS

The fast-paced, ultra-competitive atmosphere and interconnected nature of today's business environment causes constant challenges for mangers and planners alike. As discussed in this effort, high levels of uncertainty in supply and demand, shorter technology and product life cycles, globalization of the market, and the increased use of distribution, manufacturing, and logistics partners often results in a complex international network. As the level of complexity increases, interdependency becomes more prevalent, thereby increasing the level of risk (Christopher, 1992).

As previously mentioned, this research was designed to be an umbrella study, combining three related research efforts into one. The first study proposed multiple levels of interdependence experienced by organizations within a hypothetical supply chain. The study describes potential coordination strategies that allow an organization, or component of an organization, to cope with their interdependence. The application of these coping mechanisms is especially important in the face of supply chain disruptions. In this study, I propose that it is the interdependence, or rather the degree of interdependence, which determines the level of integration of the firm. The level of interdependence also drives the coordination method the firm utilizes to deal with uncertainty.

This portion of the study has contributed to a better understanding of the level of interdependence within a supply chain, the coping mechanism (coordination) required to effectively manage that interdependence, and the communication characteristics unique

to each level of coordination. The application of Systems Theory, and specifically Thompson's Levels, allows for the development of a conceptual framework for managing the interdependence between components within the supply chain as well as the increased risk of a disruption.

This framework adds to the body of knowledge regarding supply chain disruptions, risk, and management methods from both a theoretical and application perspective. The unique contribution of this review is viewing the impact of disruptions on today's interdependent supply chains and then applying the perspective of coordination as a coping mechanism. By applying systems theory, and more specifically the elements of interdependencies, coordination, and communication, this review develops the theoretical underpinning for the next two sections of the paper by establishing the need for a method of coordinating and preparing for, and reacting to disruptive events.

The second phase of the research effort focuses on one method of coordination, specifically, the contingency planning process used by an organization to prepare for and face disruptions as they occur. This effort investigates the specific characteristics of contingency planning that provide that largest contribution to organizational flexibility. Organizational flexibility as an organizational trait thereby allows the organization to alleviate problems generated due to interdependence. Ten characteristics were chosen to develop the model for this study, and were hypothesized to have a positive relationship to organizational flexibility. Simple regression techniques were used to test the model based on a data sample collected for this effort.

Overall, the model as constructed explains roughly half of the variance associated with employees' perception of organizational flexibility in the contingency planning process reporting an R^2 of .45. Of the 10 measured constructs measured, 6 were found to be significant: (a) Top Management Support, (b) Resource Alignment, (c) Information Technology Use, (d) Information Sharing, (e) Internal Collaboration, and (f) External Collaboration. Two of the significant findings however, did not support their corresponding hypotheses due to directional inconsistencies.

This portion of the research effort contributes on both a practical and research level. For planners and managers, this effort contributes to the understanding of the primary planning attributes to use to increase organizational flexibility. This foundation might be useful when both time and fiscal resources are constrained, forcing managers to focus on limited aspects of a project. The results of this effort should enable managers to focus on the attributes that provide the highest return for their planning investment. For researchers, this effort fills a gap in strategic and contingency planning literature. Little academic research has been applied specifically to contingency planning, with even fewer studies examining contingency planning in a supply chain context.

The third portion of the umbrella research effort addresses contingency planning as an innovation. Based on the research in section two, contingency planning is a useful coordination technique for dealing with supply chain disruptions; therefore, the next step is determining how to ensure that the planning technique is used across the organization. Specifically, the research explores the contingency planning process attributes that will most likely lead to successful innovation adoption by an organization. Understanding the characteristics that make a planning process more likely to be adopted by the

organization is extremely important to the ultimate success of the plan. Simply put, if individuals within the organization do not support the process they are not likely to perform it, or at least, perform it well. If management and individuals within an organization understand the variables to review prior to considering adoption of a supply chain contingency planning process, opportunities for success are enhanced.

In this portion of the study, six characteristics are hypothesized as having a positive relationship and one characteristic with a negative relationship with contingency planning process adoption. A model was developed based on these hypotheses and tested using a logistic regression technique and data collected independently for this effort. As discussed previously, contingency planning was classified as either utilized or not utilized. Since the dependent variable is dichotomous the researcher used a binomial logistic model to test the relationship between contingency planning process adoption and the hypothesized diffusion characteristics – relative advantage, compatibility, ease of use, trialability, observability, centralization, and top management support. The model was estimated with data from 152 respondents with planning responsibilities. The goal is to determine if the diffusion characteristics differed in the use or non-use of contingency planning processes.

Overall, the model correctly classified 82.9 percent of the cases. The model correctly predicted that contingency planning processes were not used in 21 of 40 cases, or 52.5% of the time. The model also correctly predicted when contingency planning processes were used in 105 out of 112 cases, or 93.8% of the time. Four of the seven hypotheses were supported including those involving relative advantage, observability, centralization, and top management support.

These essays make a contribution both independently and collectively. There is, however, still much work to be done. There is no indication that the constant possibility of disruption caused by interdependence will subside. Thus, managers and planners alike must continuously seek to understand and develop methods to counter the impacts of these disruptions by increasing their organization's flexibility and instilling the best method of facing these disruption in their organizations.

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APPENDIX A

Contingency Planning Attributes Survey

The purpose of this survey is to gather data as part of a research effort on the attributes of contingency planning. Use your lowest level organizational association, i.e. section, flight, squadron, or wing as appropriate, as a frame of reference. Also, please respond with your most recent planning experience in mind, i.e. the contingency plan that you worked with last. Please **DO NOT** include any reference to classified or sensitive information in your responses. Your responses to the questionnaire will be anonymous. The questionnaire contains 47 short questions plus demographics and should take less than 20 minutes of your time to complete.

Demographic Information:

My position within the organization is (check one):
Senior Management _____ Middle Management_____
Professional_____ Technical _____
Other_____(please specify)

Experience
I have
_____ # years in my current position _____ # years with this organization.
_____ # years planning experience.

What is your level of involvement in the planning process?
_____ Plan Development _____ Plan Implementation _____ Other

What is the size of your local organization?
_____ Less than 50 personnel _____ 51 to 100 personnel
_____ 101 to 200 personnel _____ 201 to 300 personnel
_____ Greater than 300 personnel

Please rate the following statements from (1) Very Informal to (5) Very Formal.

1	The overall level of strategic planning in my organization is	1	2	3	4	5
2	Planning for facility or operating locations in my organization is	1	2	3	4	5

3	Planning for logistics and physical distribution in my organization is	1	2	3	4	5
4	Planning for production or operations in my organization is	1	2	3	4	5
5	Planning for purchasing and materials management in my organization is	1	2	3	4	5
6	Planning for marketing systems in my organization are	1	2	3	4	5

Please rate the following statements from (1) Very Informal to (5) Very Formal.

8	My organization makes extensive use of written, long-range plans to help improve overall performance.	1	2	3	4	5
9	My organization uses a continual planning process that incorporates feedback from past experience.	1	2	3	4	5
10	My firm uses written short-range plans and budgets to manage and control operations.	1	2	3	4	5
11	My contingency planning process formally evaluates environmental constraints, firm resources, and organizational goals.	1	2	3	4	5
12	Management within my organization has performed an analysis of strengths/weaknesses and matched them to opportunities/threats.	1	2	3	4	5
13	My organization is able to accommodate special or non-routine requests.	1	2	3	4	5
14	My organization is able to handle unexpected events.	1	2	3	4	5
15	My organization is able to provide rapid response to customer requests.	1	2	3	4	5
16	A majority of our intra-organizational contingency planning is conducted using information technology.	1	2	3	4	5
17	A majority of inter-organizational contingency planning is conducted using information technology.	1	2	3	4	5
18	Direct communication between intra-organizational contingency planning partners has been established using information technology.	1	2	3	4	5
19	Direct communication between inter-organizational contingency planning partners has been established using information technology.	1	2	3	4	5
20	My organization maintains an integrated contingency planning database and access method to facilitate information sharing.	1	2	3	4	5

21	My organization effectively shares contingency planning information between departments.	1	2	3	4	5
22	My organization has adequate ability to share both standardized and customized contingency planning information internally.	1	2	3	4	5
23	My organization provides objective feedback to employees regarding integrated contingency planning process performance.	1	2	3	4	5
24	My organization's compensation, incentive, and reward systems encourage contingency planning integration.	1	2	3	4	5
25	My organization effectively shares contingency planning information with selected planning partners.	1	2	3	4	5
26	My organization has developed contingency planning performance measures that extend to our planning partners.	1	2	3	4	5
27	My organization experiences improved performance by integrating contingency planning with our partners.	1	2	3	4	5
28	My organization has contingency planning arrangements with planning partners that operate under principles of shared rewards and risks.	1	2	3	4	5
29	My organization has increased planning flexibility through planning collaboration.	1	2	3	4	5
30	My organization benchmarks best planning practices / processes and shares results with planning partners.	1	2	3	4	5
31	Top Management supports the contingency planning process.	1	2	3	4	5
32	Top Management is knowledgeable about the contingency planning process.	1	2	3	4	5
33	Top Management is involved in the development of the contingency planning process.	1	2	3	4	5
34	My organization is willing to make cooperative changes with our contingency planning partners.	1	2	3	4	5
35	My organization believes that our contingency planning partners must work together to be successful.	1	2	3	4	5
36	We view our contingency planning partners as a value added to our organization.	1	2	3	4	5
37	In my organization, we coordinate contingency planning activities with other organizations (intra-organizational).	1	2	3	4	5
38	In my organizations, we coordinate contingency planning activities with suppliers, customers, and other organizations (inter-organizational).	1	2	3	4	5
39	Information sharing systems (chat rooms, newsgroups, bulletin boards, BLOGS) are being used with contingency planning partners, where appropriate.	1	2	3	4	5

40	Key contingency planning partners participate in the development and design of new products or services.	1	2	3	4	5
41	Projections of future requirements / needs are shared with contingency planning partners to ensure adequate capacity to support organizational operations.	1	2	3	4	5
42	Formal information requests between contingency planning partners have been reduced or eliminated and replaced by information sharing systems.	1	2	3	4	5
43	Top management is in routine contact with organizational contingency planning partners.	1	2	3	4	5
44	Direct communications between intra-organizational contingency planning partners has been established to improve responsiveness.	1	2	3	4	5
45	Direct communications between inter-organizational contingency planning partners has been established to improve responsiveness.	1	2	3	4	5
46	Our organization shares personnel with our intra-organizational contingency planning partners to enhance communication.	1	2	3	4	5
47	Our organization shares personnel with our inter-organizational contingency planning partners to enhance communication.	1	2	3	4	5

Thank you for you time and efforts in completing this survey.

APPENDIX B

Contingency Planning Process Innovation Survey

The importance of planning for contingencies in everyday operations is well known. From extreme instances such as Sept 11 and Hurricane Katrina to the numerous interruptions involved in day-to-day operations, all organizations must keep operating to survive. The contingency planning process has been identified as one means of preparing for these nearly unavoidable situations.

The purpose of this survey is to gather data as part of a research effort on the adoption of a contingency planning process. I hope to determine the relationship between several selected innovation characteristics and the adoption of the planning innovation. In the survey below, each section is preceded by a brief explanation of what that section entails. Your responses to the questionnaire will be anonymous. The questionnaire contains 23 questions and should take less than 20 minutes of your time.

If you have any questions, you can contact me at skippjb@auburn.edu.

I look forward to receiving your completed questionnaire and sincerely appreciate your participation in this study.

Demographic information.

My organization is:
Small (<100 personnel) _____, Medium (100 – 300) _____, Large (> 300)_____

My position within the organization is (check one):
Senior Management _____ Middle Management_____ Professional_____
Other_____(please specify)

I have ___ # years in my current position. I have ___ # years with this organization.
I have ___ # years planning experience.

My Organization utilizes a formal contingency planning process.
Yes____ No____

Contingency Planning Process (CP Process) Innovation Survey

Please rate the following statements from (1) Strongly Disagree to (7) Strongly Agree.

1	Using the CP Process enables me to accomplish tasks more quickly.	1	2	3	4	5	6	7
2	Using the CP Process improves the quality of work I do.	1	2	3	4	5	6	7
3	Using the CP Process makes it easier to do my job.	1	2	3	4	5	6	7
4	Using the CP Process enhances my effectiveness on the job.	1	2	3	4	5	6	7
5	Using the CP Process gives me greater control over my work.	1	2	3	4	5	6	7
6	Using the CP Process is compatible with all aspects of my work.	1	2	3	4	5	6	7
7	I think that using the CP Process fits well with the way I like to work.	1	2	3	4	5	6	7
8	Using the CP Process fits into my work style.	1	2	3	4	5	6	7
9	My interaction with the CP Process is clear and understandable.	1	2	3	4	5	6	7
10	I believe that it is easy to get the CP Process to do what I want it to do.	1	2	3	4	5	6	7
11	Overall, I believe that the CP Process is easy to use.	1	2	3	4	5	6	7
12	Learning to operate the CP Process is easy for me.	1	2	3	4	5	6	7
13	Visible evidence of the CP Process is found throughout the workspaces of my organization.	1	2	3	4	5	6	7
14	The CP Process is not very visible in my organization.	1	2	3	4	5	6	7
15	Before deciding whether to use any CP Process, I was able to properly try it out.	1	2	3	4	5	6	7
16	I was permitted to utilize a CP Process on a trial basis long enough to see what it could do.	1	2	3	4	5	6	7
17	Participation of subordinates in organizational decision-making is encouraged in the CP Process.	1	2	3	4	5	6	7
18	Little action can be taken until a superior approves a decision in the CP Process.	1	2	3	4	5	6	7
19	People who wants to make their own decisions regarding the CP Process will be quickly discouraged here.	1	2	3	4	5	6	7
20	There is frequent participation of subordinates in decisions on the adoption of new CP Processes.	1	2	3	4	5	6	7
21	Top Management is interested in the implementation of a CP Process.	1	2	3	4	5	6	7
22	Top Management considers a CP Process as important to the organization.	1	2	3	4	5	6	7
23	Top Management has effectively communicated its support for a CP Process.	1	2	3	4	5	6	7

Thanks for taking our survey. As part of our ongoing study, would you be interested in participating in a short-term discussion on the importance of a contingency planning process? The goal of this discussion is to determine why planning is readily accepted by some organizations and fails miserably in others. If you would like to participate, please provide an email address below and answer the following question.

Email address:

In your opinion, what attributes make an organization more likely to adopt a formal contingency planning process?